PROJECT MANUAL

for

NEW JUNIOR AND SENIOR HIGH SCHOOL
Buffalo Island Central School District
Monette, Arkansas

Architect Engineer Project No. 2016-028

February 15, 2017

CROMWELL

cromwell architects engineers, inc.

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SECTION 00 01 05

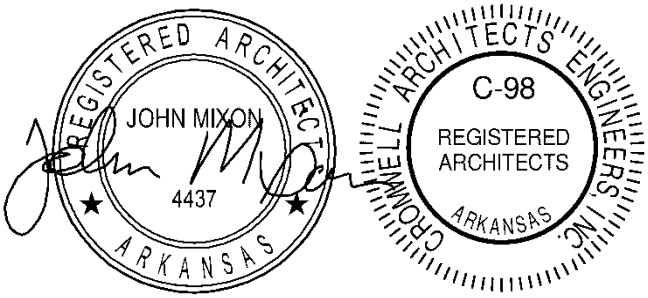
CERTIFICATIONS

I hereby certify that the architectural portions of work included in these plans and specifications, except as otherwise indicated by other registered professionals, have been prepared by me or under my direct supervision, and that I have coordinated the architectural portions with those portions sealed by other registered professionals. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas and with the Arkansas Code for Energy Conservation In New Building Construction.

John Mixon, AIA
Architect

CROMWELL ARCHITECTS
ENGINEERS, INC.
Architects Engineers
101 S. Spring Street
Little Rock, Arkansas

15 FEB 2017
Date



I hereby certify that the civil portions and structural portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

Michael Tarini, PE
Civil Engineer

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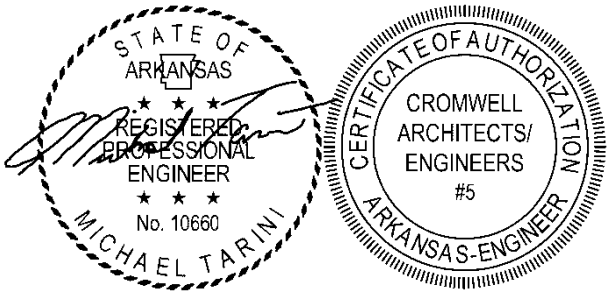
ENGINEERS, INC.
Architects Engineers
101 S. Spring Street
Little Rock, Arkansas

15 FEB 2017
Date

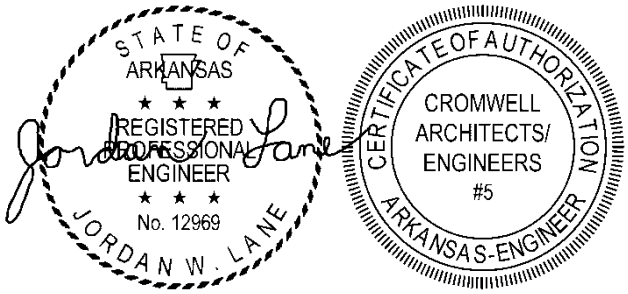


I hereby certify that the structural portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

Jordan W. Lane, PE
Structural Engineer

CROMWELL ARCHITECTS
ENGINEERS, INC.
Architects Engineers
101 S. Spring Street
Little Rock, Arkansas

15 FEB 2017
Date



I hereby certify that the mechanical portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision. I further certify that to the best of my knowledge this portion of the plans and specifications are as required by law and in compliance with the Arkansas Fire Prevention Code for the State of Arkansas and with the Arkansas Code For Energy Conservation In New Building Construction.

Robert L. Seay, PE, Mechanical Engineer
Principal

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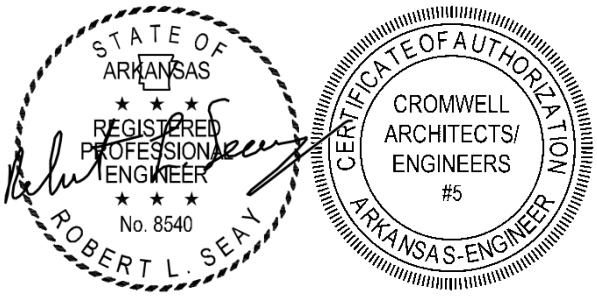
ENGINEERS, INC.
Architects Engineers
101 S. Spring Street
Little Rock, Arkansas

15 FEB 2017
Date



I hereby certify that the electrical portions of work included in these plans and specifications, except as otherwise indicated, have been prepared by me, or under my direct supervision.

Pamela S. McElrath, PE
Electrical Engineer

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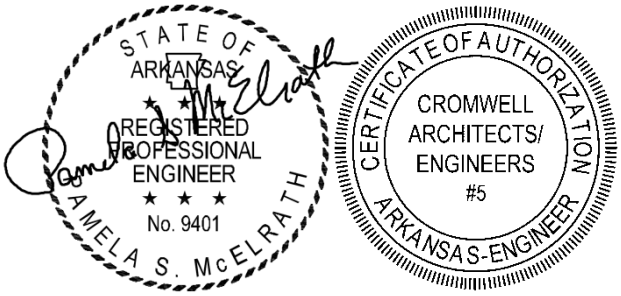
ENGINEERS, INC.
Architects Engineers
101 S. Spring Street
Little Rock, Arkansas

15 FEB 2017
Date



SECTION 00 01 10

TABLE OF CONTENTS

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SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

SUMMARY

1.01 MODIFICATIONS TO AIA A701

A. Refer to AIA Document A701, Instructions to Bidders, as amended, for the original text of the published standard instructions to bidders with Project specific changes indicated as modified text inline with the original text. References to Instructions to Bidders shall be as referring to the standard text as modified.

1.02 SEE AIA DOCUMENT A701 - INSTRUCTIONS TO BIDDERS FOLLOWING THIS DOCUMENT.

END OF SECTION

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Instructions to Bidders

AIA Document A701 - 1997
1997 Edition -Electronic Format

TABLE OF ARTICLES

ARTICLE 1 DEFINITIONS

1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

1.3 Addenda are written or graphic instruments issued by the Architect Engineer prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

2.1 The Bidder by making a Bid represents that:

2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

2.1.2 The Bid is made in compliance with the Bidding Documents.

2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

3.1 COPIES

3.1.1 Bidders may review and/or obtain complete sets of the Bidding Documents from the issuing office as designated in the Advertisement or Invitation to Bid. ~~in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.~~

3.1.2 ~~Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.~~ Bidders may access complete electronic documents through the Cromwell Newforma Info Exchange web site. Valid email address required for accessing the Info Exchange web site; contact printshop@cromwell.com. Info Exchange will send email with instructions and links to the Info Exchange web site instead of attachments.

.1 Hard copies of the Project Manual and Drawings may also be purchased for a non-refundable fee at the office of Cromwell Architects Engineers, printshop@cromwell.com and as indicated in the Invitation To Bid.

.2 Bidders, Subcontractors, suppliers, and others who obtain plans directly from any other source are fully responsible for obtaining all necessary documents for a complete bid. This includes the verification and incorporation of addenda or revision bulletins, prior to bidding the project.

3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect Engineer assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

3.1.4 The Owner and Architect Engineer may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect Engineer errors, inconsistencies or ambiguities discovered.

3.2.2 Requests from Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect Engineer at least seven days prior to the date for receipt of Bids. Requests shall be made through a prime Bidder.

3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

3.3 SUBSTITUTIONS

3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect Engineer at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect Engineer's decision of approval or disapproval of a proposed substitution shall be final.

3.3.3 If the Architect Engineer approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

3.3.4 ~~No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.~~ Substitutions will be considered after the contract has been executed and in accordance with the Conditions of the Contract and Division 01 requirements.

3.4 ADDENDA

3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 Deleted ~~Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.~~

3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

4.1.1 Bids shall be submitted on the forms included with the Bidding Documents. Copies of the forms included with the Bidding Documents may be submitted. Submit one copy of the Bid Proposal.

4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

4.1.3 ~~Sums~~ Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid. Proposals carrying riders or qualifications to be bid as submitted will be rejected as irregular.

4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

4.1.8 All bid prices, whether by units or otherwise, shall include all State and local sales or use taxes. No amount above the contract price will be paid for claims for such taxes.

4.2 BID SECURITY

4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Invitation To Bid or Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Paragraph 6.2.

4.2.2 ~~If a surety bond is required, it~~ Bid security shall be in the amount of 5% of the Base Bid. Bid security shall be written on AIA Document A310, Bid Bond~~, unless otherwise provided in the Bidding Documents, and the~~. Bid bond, if used, shall be from a reliable surety company licensed to operate in the State of Arkansas and listed in the United States Treasury Department's Circular 570. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

4.3 SUBMISSION OF BIDS

4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

4.4 MODIFICATION OR WITHDRAWAL OF BID

4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

4.4.5 Bidders may submit written modification (if any) on Bidder's letterhead stationery and at any time prior to the bid opening date and time. Written changes on bid envelope will not be accepted.

ARTICLE 5 CONSIDERATION OF BIDS

5.1 OPENING OF BIDS

At the discretion of the Owner~~, if stipulated in the Advertisement or Invitation to Bid~~, the properly identified Bids received on time will be publicly ~~-~~opened and will be read aloud. Bids will be taken under advisement. An abstract of the Bids may be made available to Bidders.

5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

5.3 ACCEPTANCE OF BID (AWARD)

5.3.1 It is the intent of the Owner to award a Contract to the lowest quailed qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

5.3.2 The Owner shall have the right to accept Alternates (if any) in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

6.1 CONTRACTOR'S QUALIFICATION STATEMENT

~~Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request,~~ Low bidder shall submit upon request a properly executed AIA Document A305, Contractor's Qualification Statement for consideration and as a prerequisite to the award of the contract, unless such a Statement has been ~~previously required and submitted as a prerequisite to the issuance of Bidding Documents.~~ submitted for review to the Architect Engineer's office within the past six months.

6.2 OWNER'S FINANCIAL CAPABILITY

The Owner shall, at the request of the Bidder to whom award of a Contract is under consideration and no later than seven days prior to the expiration of the time for withdrawal of Bids, furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. Unless such reasonable evidence is furnished, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

6.3 SUBMITTALS

6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect Engineer in writing:

.1 a designation of the Work to be performed with the Bidder's own forces;

.2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and

.3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

6.3.2 The Bidder will be required to establish to the satisfaction of the Architect Engineer and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

6.3.3 Prior to the execution of the Contract, the Architect Engineer or Owner will notify the Bidder in writing if either the Owner or Architect Engineer, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect Engineer has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect Engineer have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect Engineer.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

7.1 BOND REQUIREMENTS

7.1.1 ~~If stipulated in the Bidding Documents,~~ The Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

7.1.2 ~~If the furnishing of such bonds is stipulated in the Bidding Documents, the~~ The cost shall be included in the Bid. ~~If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.~~

7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

7.2 TIME OF DELIVERY AND FORM OF BONDS

7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement

of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Subparagraph 7.2.1.

7.2.2 ~~Unless otherwise provided,~~ The bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. ~~Both bonds shall be written in the amount of the Contract Sum~~. Extent of the Performance Bond and the Labor and Material Payment Bond shall each be written in the amount equal to 100 percent of the Contract Sum. (Arkansas Code §§ 19-4-1405 et seq., §§ 22-9-401 et seq., §§ 18-44-501 et seq.)

7.2.3 The bonds shall be dated on or after the date of the Contract.

7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

ARTICLE 9 ADDITIONAL REQUIREMENTS

9.1 RETAINAGE

A retainage will be withheld from Progress Payments as specified in the General Conditions.

9.2 TIME OF COMPLETION

The Work required by the Contract Documents shall be Substantially Complete as indicated in the Bid Proposal.

9.3 MANDATORY PRE-BID CONFERENCES

There are no mandatory pre-bid conferences scheduled.

9.4 NON-COLLUSIVE AFFIDAVIT

By submitting a bid, the Bidder represents and warrants that such bid is genuine and is neither collusive or made in the interest of any person not named, and that he has neither induced nor solicited any other company to place a sham bid nor directly or indirectly caused another company to refrain from or be unable to present a bid.

9.5 PENALTY FOR COLLUSION

If at any time it shall be found that the person, firm or corporation to whom a contract has been awarded has, in presenting any bid, colluded with any other party or parties, then the contract so awarded shall be null and void and the contractor shall be liable to the Owner for any and all loss and damage of whatever nature, which the Owner may suffer and the Owner shall seek a new contractor.

9.6 CONFLICT OF INTEREST

By submitting a bid, the company represents and warrants that no director or employee of the Owner is in any manner interested directly or indirectly in the bid or contract which may result from it or in any of the expected profits which might arise therefrom; and, that no attempt has been made to influence or gain favorable advantage by communicating directly or indirectly with any official of the Owner. It is understood, that any action taken which might tend to degrade the integrity of the competitive bidding process will be considered as grounds for disqualification.

9.7 INDEMNIFICATION

Contractor agrees to save and hold harmless and to indemnify the Owner against any and all liability, losses, claims or costs of whatever kind of nature for any occurrence or accident in connection with or in the performance of any work/services pursuant to the award whether to property or persons.

9.8 RESERVATIONS

Soliciting bids does not commit the Owner to award a contract, to pay any costs incurred in the preparation of a bid in response to this bid, or to procure or contract for services or supplies. The Owner reserves the right to accept, or reject, in part or its entirety, any bid received as a result of this solicitation, if it is in the best interest of the Owner to do so.

9.9 DISCRIMINATION

In the event a contract is entered into pursuant to this solicitation, the bidder shall not discriminate against any qualified employee or qualified applicant for employment because of race, sex, color, creed, national origin, ancestry, or disability. The contractor must include in any and all subcontracts a provision similar to the preceding.

9.10 ASSIGNMENTS

Neither this contract nor any interest therein nor claim thereunder shall be assigned or transferred by the Contractor except as expressly authorized in writing by the Owner and no contract shall be made by the Contractor with any other party for furnishing any of the work or services herein contracted for without the written approval of the Owner.

9.11 SMALL, MINORITY, AND WOMEN BUSINESS ENTERPRISES

All small, minority, and women business enterprises are encouraged to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

9.12 ILLEGAL IMMIGRANTS

The lowest responsible bidder shall certify prior to executing the contract that they do not employ or contract with any illegal immigrants. Bidders shall certify online at: www.ark.org/dfa/immigrant/index/php/user/login. Arkansas Code Annotated § 19-11-105 .

9.13 RELATED WEB LINKS

For Bidder's information and convenience following are related website resources:

State of Arkansas; www.state.ar.us or www.accessarkansas.org
Arkansas Code On-line; www.lexisnexis.com/hottopics/arcade/default.asp
Arkansas Legislature; www.arkleg.state.ar.us
Arkansas Contractor's Licensing Board; www.state.ar.us/clb & http://www.contractors-license.org/ar/ar.htm
Arkansas Department of Health; www.healthyarkansas.com/rules_regs/rules_regs.htm & www.healthyarkansas.com/phc/
U.S. Occupational Safety and Health Agency; http://www.osha.gov

APPENDIX D. **11/17/2006**

INVITATION FOR BIDS

SECTION I: GENERAL INSTRUCTIONS, TERMS AND CONDITIONS

These General Instructions, Terms and Conditions and any special terms and conditions become part of any contract entered into in the event any part or all of the bid is accepted by the Buffalo Island Central School District. Any special terms and conditions included in the Invitation for Bids override these general instructions, terms and conditions.

DEFINITION OF TERMS

IFB shall mean Invitation for Bids.

The words vendor, bidder, offerer, company, proposer and contractor may be used synonymously in this document.

The terms "District" or "Owner" are used interchangeably and refer to the Buffalo Island Central School District.

SUBMISSION OF BID

Bids must be submitted to this office using the forms included on or before the date and time specified for bid opening. Each bid should be placed in a separate envelope completely and properly identified using the enclosed mailing label reflecting bid number, bid title and bid opening date/time. Late bids will not be considered under any circumstances.

Failure to sign the bid may result in disqualification. The person signing the bid should show title or authority to bind his/her firm to a contract. Signature must be in ink. Bid must be completed in ink or typed.

ASSIGNMENTS:

Neither party to the Contract shall assign the Contract without written consent of the other. ~~Neither this contract nor any interest therein nor claim thereunder may or shall be assigned or transferred by the contractor except as expressly authorized in writing by the District. No contract, subcontract or agreement shall be made by the contractor with any other party for furnishing any of the product, work or services herein contracted without the consent of the District.~~

CONFLICT OF INTEREST

By submitting a bid, the contractor represents and warrants that no director, board member or employee of the District is in any manner interested directly or indirectly in the bid or contract which may result from the bid or in any of the expected profits which might arise therefrom; further, that no attempt has been made to influence or gain favorable advantage by communicating directly or indirectly with any official of the School District. It is understood that

any action taken which might tend to degrade the integrity of the competitive bidding process will be considered as grounds for disqualification or a breach of this contract.

CONTRACT CHANGES

In no event shall any understanding or agreement, contract modification, change order or other matter which would constitute a deviation from the terms of this contract be effective or binding upon the District unless expressly stated and agreed to in writing executed by the School District Official possessing contractual authority for said district.

CONTRACT GUIDELINES

Offerers agree that a contract does not become effective until it is awarded and a written agreement, purchase order, award letter, or other notice to proceed is executed or issued by the District and the contractor.

INDEMNIFICATION AND LEGAL COMPLIANCE: ~~(may be substituted by Para. 3.18 AIA 201-1997 contract).~~

See General Conditions AIA Document A201-2007 ~~1997~~ paragraph 3.18. ~~The contractor shall at all times observe and fully comply with any and all Federal, State and local laws, statutes, orders, ordinances and regulations. The contractor agrees to save, hold harmless and to indemnify the District, its agents, employees, officers and board members against any and all liability, losses, claims or costs of whatsoever kind or nature relative to the performance of the contract or any occurrence or accident in connection with inadequate design, breach of contract, material failure, default or the performance of any work, services or products supplied, pursuant to the award, whether to property or persons. Further, contractor shall indemnify, hold harmless and defend the District, its agents, employees, officers and board members from any lawsuits, causes of action, claims, liabilities and damages, of any kind and nature, including but not limited to, attorney's fees and costs, arising out of the performance of this contract whether attributable in whole or in part to any act, omission or negligence of the District, its agents or employees, including, but not limited to, any and all lawsuits, causes of action, claims, liabilities, and damages which the District, its agents or employees may sustain by reason of any failure by contractor to indemnify as provided herein, or any failure by contractor to otherwise perform its obligations pursuant to this contract, or by reason of the injury to or death of any person or persons or the damage to, loss of use of or destruction of any property resulting from work undertaken herein.~~

MINORITY BUSINESS POLICY

It is the policy of the Buffalo Island Central School District that minority business enterprises shall have the maximum opportunity to participate in the District's purchasing process. Therefore, the District encourages all minority businesses to compete for goods, services, and construction contracts.

NON-COLLUSIVE AFFIDAVIT

By submitting a bid, the company and the individual personally signing the bid represent and warrant that such bid is genuine and is neither collusive nor made for or on behalf of any person not named, and that he has neither induced nor solicited any other company to place a sham

bid nor directly or indirectly caused another company to refrain from or be unable to present a bid.

NON-DISCRIMINATION

The company shall not discriminate against, or segregate, a person or a group of persons on account of race, color, creed, religion, sex, sexual orientation, marital status, familial status, national origin, ancestry, disability or condition of acquired immune deficiency syndrome (AIDS) or AIDS-related complex in carrying out its duties and obligations pursuant to this agreement nor shall the company or any person claiming under or through the company establish or permit any such practice or practices of discrimination or segregation. The company must include in any and all subcontracts a provision similar to the proceeding.

PENALTY FOR COLLUSION

If at any time it shall be found that the person, firm or corporation to whom a contract has been awarded has, in presenting any bid, colluded with any other party or parties, then, in the sole discretion of the District, the contract so awarded shall be null and void or considered breached and the contractor shall be liable to the District for any and all loss and damage of whatsoever nature, which the District may suffer and the District may seek a new contractor.

PROPRIETARY INFORMATION

All information submitted in response to this bid is public after the bid opening. The bidder should not include as a part of the response to the invitation to bid any information which the bidder believes to be a trade secret or otherwise privileged or confidential. If the bidder wishes to include such material with a bid, then the material should be supplied under separate cover and identified as confidential. The District does not warrant or agree to, but will endeavor to, keep that information confidential. Contractor acknowledges that information in the possession of the District may be subject to the provisions of the Arkansas Freedom of Information Act.

REJECTION OF BIDS

The District may reject any and all bids and may reject a bid of any party who has failed to perform, been unfaithful and/or delinquent in any former relationship with the District. The District reserves the right to waive any irregularities or formalities in any solicitation or bid response. The District shall be the sole judge as to which bid is best and, in determining that fact, may consider the contractor's business integrity, financial resources, experience, facilities and/or capacity for performing the work.

RESERVATIONS

This IFB does not commit the District to award a contract, to pay any costs incurred in the preparation of a bid in response to this invitation, or to procure or contract for services or supplies. The District reserves the right to accept, or reject, in part or its entirety, any bid received as a result of this IFB, if it is in the best interest of the District to do so.

SEVERABILITY

The finding or determination of any part or parts of the General Instruction, Terms and Conditions is void, unenforceable, invalid or voidable shall result in only that part being stricken with the remainder to continue in full force and effect.

STATEMENT OF EXPERIENCE AND QUALIFICATIONS

The company may be required, upon request, to prove to the satisfaction of the District that they have the skill, experience and the necessary facilities and financial resources to perform the contract in a satisfactory manner and within the required time. If the evidence of competency is not satisfactory, the bid of such company may be rejected.

WITHDRAWAL OF BID

A bid may be withdrawn before the expiration of the time during which bids may be submitted, without prejudice, by submitting a written request for its withdrawal to the District Contacting Official.

SECTION 2: SPECIAL INSTRUCTIONS, TERMS AND CONDITIONS

~~BID GUARANTEE AND~~ PERFORMANCE BONDS

~~Each bid will include with it a bid bond in the amount of 5% of the total bid offered. It will be in the form of a cashier's check or insurance surety bond (with Power of Attorney attached) made payable to the owner.~~

If a bid is over $20,000, a Performance and Payment bond ~~will~~may be required of ~~also be furnished by~~ the successful bidder within ten (10) days after receipt of the Buffalo Island Central School District intent to award notice. Identify the Performance and Payment bond rate or cost on the bid form. Failure to furnish the required bonds may cause forfeiture of bid guarantee to the owner as liquidated damages.

If required, the ~~The~~ "Performance and Payment Bond" will be in the amount equal to 100% of the contract price as security for the faithful performance of this contract price and for payment of all indebtedness for labor and materials furnished or performed in connection with this contract. The bond will be written by a surety company which is qualified and is authorized to do business in the State of Arkansas, according to A.C.A. 22-9-402(a)(b) and filing with said bond, his power of attorney as his authority. The bond will be written in favor of the Owner and executed per Arkansas state law. An original and two (2) copies of the bond must be furnished, with power of attorney attached to each. The Contractor will file and record the original with the Clerk in the Circuit Court of ~~St Francis~~ the County in which the project is located. The Contractor is to pay all expense incidentals to file the bond. The remaining two copies should be certified by the Clerk to evidence the filing of the original and these two copies submitted to the Buffalo Island Central School District ~~Construction Manager~~.

NO SMOKING POLICY

The Buffalo Island Central School District has a No Smoking Policy on all school properties.

It is the policy of the Board of Education that all uses of tobacco and tobacco products, including smokeless tobacco, will be prohibited on all District facilities. At no time will the use of tobacco products be permitted in classrooms, corridors, restrooms, locker rooms, work areas, cafeterias, offices, faculty lounges, gymnasiums, all other rooms and school grounds.

This policy applies to all Staff Members, Students, Visitors, General Contractors, Sub-Contractors, and Vendors. This policy is strictly enforced without exception.

INSURANCE REQUIREMENT

See General Conditions AIA Document A201-2007 ~~1997~~ Article 11 Insurance and Bonds~~,~~ and Nabholz ~~Construction Master Contract~~ insurance requirements~~ and attached sample certificate of insurance requirements. After bids are opened, the apparent low bidder must provide proof of insurance within five (5) business days from date of request by the District. Insurance must provide sufficient liability protection for all claims, whether direct or indirect, resulting from contractual operations. Failure to submit an insurance certificate by the time provided may be cause for bid disqualification. The following are recommended amounts for insurance coverage: (The District reserves the right to lower/raise these coverages if it is in the best interest of the District).~~

~~The Forrest City School District must be named as additional insured, and the certificate must contain a clause that the insurer will not cancel or change the insurance without first giving the Forrest City School District a minimum of 30 days prior written notice.~~

~~1.Workmen's Compensation – Statutory Limits.~~
~~2.General Liability~~
~~General Aggregate - $2,000,000~~
~~Each Occurrence - $1,000,000~~

~~**Builder's Risk – Fire Extended Coverage and Vandalism and Malicious Mischief Insurance**: The Contractor shall procure and maintain during the term of this contract and until work has been completed and accepted, Builder's Risk, Fire Extended Coverage, Vandalism and Malicious Mischief Insurance for an amount equal to 100% of the insurable property value of the project less the cost of any excavation, brick, stone or concrete foundation, piers or other supports which are below the under surface of the lowest basement floor or where there is no basement, piers which are below the surface of the ground or underground flues, pipes or wiring, said insurance coverage to be written in the name of the Contractor and Owner.~~

~~The required insurance must be written by a company licensed to do business in the State of Arkansas in accordance with A.C.A. 23-63 at the time the policy is issued. In addition, the companies must be acceptable to the Owner and Owner's agent.~~

~~**CANCELLATION PROVISIONS: (May be substituted by Para. 14.2 AIA 201-1997).**~~

~~Cancellation for Cause: The District may cancel the contract at any time for breach of contractual obligations by providing the contractor with a written notice of such cancellation. Should the District exercise its right to cancel the contract for such reasons, the cancellation shall become effective on the date as specified in the notice of cancellation sent to the contractor.~~

PRICING

Bid hereinafter is understood to include all expenses, taxes, incidentals and overhead; including, but not limited to wages, fringe benefits, supervision, material and equipment costs and it is further understood that the bidder shall bear the sum of all supplies (except as otherwise specified) necessary or desirable in order to perform the work. Pricing shall be made on those considerations specified in the aforementioned instructions for an award. No bidder may withdraw his bid for a period of 30 days after the date of bid opening.

AWARD OF CONTRACT

Bids will be considered on the basis of the price, however, the District reserves the right to establish the award criteria and to reject any or all and to award the Contract to the firm who, in the judgment of the District, is the best qualified to perform the work.

END OF APPENDIX D

SECTION 00 31 00

AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of the Contract Documents, as follows:

B. Geotechnical Report: Entitled Subsurface Exploration Buffalo Island Central Campus, Monette, Arkansas, dated April 8, 2016.
   1. Prepared by Professinal Service Industries, Inc., Memphis, Tennessee.
   2. For Contractor's convenience a copy is included following end of this section.
   3. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of the Architect Engineer.
   4. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the Contract Documents.
   5. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SUBSURFACE EXPLORATION
BUFFALO ISLAND CENTRAL CAMPUS
MONETTE, ARKANSAS

Prepared for:

CROMWELL
Jonesboro, Arkansas

Prepared by:

GEOTECHNOLOGY, INC.
Memphis, Tennessee

Geotechnology Project No. J026679.01A

April 8, 2016

GEOTECHNOLOGY INC
FROM THE GROUND UP

April 8, 2016

J026679.01A

Mr. Jordan Lane, PE, SE.
Senior Engineer, Structural
Cromwell
505 Union Street
Jonesboro, Arkansas 72401

SUBSURFACE EXPLORATION
BUFFALO ISLAND CENTRAL CAMPUS
MONETTE, ARKANSAS

Dear Mr. Lane:

Enclosed is the report of the subsurface exploration performed by Geotechnology, Inc. for the referenced project. The report includes our understanding of the project, observed site conditions, conclusions and/or recommendations, and support data as listed in the Table of Contents.

It has been our pleasure to provide these services to you, and we would welcome the opportunity to provide other services during the course of the project. Please contact us if you need further information or clarification about this document.

Very truly yours,

GEOTECHNOLOGY, INC.

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
No. 10815
ASHRAF S. ELSAYED

Ashraf S. Elsayed, Ph.D., P.E., D.GE
Chief Engineer – Memphis Branch

PDB/ASE/JAB:pdb

Copies submitted: (2) Hard copies
(1) PDF copy

SUBSURFACE EXPLORATION
BUFFALO ISLAND CENTRAL CAMPUS
MONETTE, ARKANSAS

TABLE OF CONTENTS

ILLUSTRATIONS

APPENDICES

SUBSURFACE EXPLORATION
BUFFALO ISLAND CENTRAL CAMPUS
MONETTE, ARKANSAS

SECTION I – PROJECT INFORMATION

AUTHORIZATION

The services documented in this report were provided in accordance with the scope of services described in Geotechnology's Proposal No. P026679.01 dated February 12, 2016. Our services were authorized by signed acceptance on February 15, 2016 by Mr. John Mixon, Architect, Cromwell.

PURPOSE AND SCOPE OF SERVICES

The purpose of our services was to evaluate the subsurface conditions in the proposed construction area and to develop recommendations for geotechnical aspects of the design and construction of the project as defined in the scope of services of the referenced proposal. The services consisted of drilling eight borings, laboratory testing, engineering analyses, and preparation of this report. Important Information prepared by The Geotechnical Business Council (GBC) of the Geoprofessional Business Association for studies of this type is presented in Appendix A for your review.

SITE AND PROJECT DESCRIPTION

The project site is located at 805 West Dew Avenue in Monette, Arkansas as shown on Plate 1. The site is currently developed as the Buffalo Island Central Senior High School facility and includes seven single story structures. The remainder of the site is relatively flat with parking and drives separated by grassy areas. A gravel parking area is located along the south edge of the site. Trees are present in the grassy area between parking lots in the north portion of the site. Virginia Avenue crosses the center of the site in the east/west direction. An unnamed tributary to the St. Francis River is approximately 1,800 feet to the southwest of the site. Grading and drainage plans were not available at the time of this report. It is our understanding that 2 to 3 feet of fill will be placed across the site.

The project consists of the construction of a new campus. The campus will include an approximately 50,000 square foot (sf), single-story school building with ancillary driveway and parking areas. Site preparation will include demolition of four of the existing structures and the portion of Virginia Avenue that crosses the site. Three of the existing structures in the northwest corner of the site will remain. The maximum column and wall loads are reported to be 40 kips and 2 kips per lineal foot, respectively.

SECTION II - FIELD EXPLORATION AND LABORATORY TESTING

FIELD EXPLORATION

The field exploration consisted of drilling eight borings, designated as Borings B-1 through B-8, at the approximate locations shown on Plate 2. Borings B-1 through B-6 were drilled in the area of the proposed structure. Borings B-7 and B-8 were drilled in the proposed parking and drive areas. A representative from Geotechnology located the borings by referencing site features. The client should retain a registered land surveyor to establish exact boring locations and elevations if precise data are required.

The borings were drilled to approximate depths of 10 to 60 feet using a rotary drill rig (Mobile B-58) and 3¾-inch inner diameter hollow stem augers. Standard Penetration Tests (SPT's) were performed using an automatic hammer. Blow counts, or 'N'-values, were recorded and are presented on the boring logs. Split spoon samples and relatively undisturbed Shelby tube samples were obtained in general conformance with applicable ASTM standards at the depths indicated on the boring logs. The collected samples were visually examined by the drill crew and transported to the laboratory for further testing and for examination by a geotechnical professional from Geotechnology. The boring logs are presented in Appendix B. An explanation of the terms and symbols used on the boring logs is also provided in Appendix B.

The boring logs represent conditions observed at the time of exploration and have been edited to incorporate results of the laboratory test data, as appropriate. Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials could be gradual or could occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by Geotechnology in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

The boring logs and related information depict subsurface conditions only at the specific locations and times where sampling was conducted. The passage of time could result in changes in conditions, interpreted to exist, at or between the locations where sampling was conducted.

LABORATORY TESTING

Soil samples collected from the borings were visually examined in the laboratory and subsequently classified in general accordance with the Unified Soil Classification System (ASTM D 2487 and D 2488). Laboratory tests were performed on select soil samples to evaluate pertinent engineering and index properties. The testing consisted of moisture contents, Atterberg limits, grain size analysis, sulfate content, chloride content, pH, electrical resistivity, unconfined compression (UC) and unconsolidated-undrained triaxial compression (UU). Most of the laboratory test results are presented on the boring logs in Appendix B. The results of the Atterberg limits, grain size analyses, sulfate content, chloride content, UC and UU tests are also included in Appendix C. The laboratory test and corresponding test method standard used are presented in the following table.

Summary of Laboratory Tests and Methods	
Laboratory Test	**Test Method**
Moisture Content	ASTM D 2216
Atterberg Limits	ASTM D 4318
Gradation	ASTM D 422/1140
Sulfate Content	EPA Method 9056
Chloride Content	EPA Method 9056
pH of Soils	ASTM D 4972
Electrical Resistivity	ASTM G 187
Unconfined Compression	ASTM D 2166
Unconsolidated-Undrained Triaxial Compression (UU)	ASTM D 2850

SECTION III – GENERAL SUBSURFACE CONDITIONS

STRATIGRAPHY

The stratigraphy encountered in the borings generally consisted of fine- and coarse-grained soils in the upper 15 feet underlain by coarse-grained soils to the maximum depth of exploration of 60 feet. Highly plastic soils were encountered in Boring B-10 to a depth of approximately 6 feet.

The upper fine-grained soils consisted of clay, sandy clay (CL) and silty clay (CL-ML). The moisture content of the tested samples ranged from 18 to 39 percent. The liquid limits (LL) and plasticity indices (PI) of the tested samples ranged from 26 to 49 percent and 7 to 27 percent, respectively. The SPT N-values ranged from 5 to 11 blows per foot (bpf). The UC and UU tests on the relatively undisturbed samples yielded undrained shear strengths ranging from 1,200 to 2,590 pounds per square foot (psf). The results of the field and laboratory tests indicated medium stiff to hard consistencies for the fine-grained soil.

The coarse-grained soils consisted of sand (SP), clayey sand (SC), silty sand (SM) and silty, clayey sand (SC-SM). The SPT N-values ranged from 3 to 28 bpf indicating very loose to medium dense densities for the coarse-grained soil.

GROUNDWATER

Groundwater was encountered in Borings B-1 through B-6 at a depth of approximately 13.5 feet during drilling operations. Groundwater levels could vary significantly over time due to the effects of seasonal variation in precipitation, recharge, proximity to the unnamed tributary or other factors not evident at the time of exploration.

SECTION IV – DESIGN CONSIDERATIONS AND RECOMMENDATIONS

SOIL CORROSIVITY AND CEMENT TYPE

Chemical tests were conducted on select samples to evaluate the corrosion potential of the subgrade soils. Concentrations of chloride and sulfide and pH levels were determined on samples from Boring B-6 at depths between 0 and 5 feet. Testing of the selected samples yielded concentrations of chloride below the minimum quantification limit (MQL) of 4.00 milligrams per kilogram (mg/KG) and concentrations of sulfide of 19.4 mg/Kg.

Cement Type. Chloride and sulfide concentrations are low. As such, the site soils have a low potential for chemical attack, and Type I or Type III Cement may be used for below-grade construction.

DESIGN SEISMIC INFORMATION

The site lies within the influence of the New Madrid Seismic Zone (NMSZ). It is our understanding the proposed structure will be designed in accordance with the International Building Code (IBC) 2012. The site is estimated to be Site Class "D", based on our experience in the vicinity of the site. The design spectral accelerations for the design seismic event were obtained from the USGS Seismic Design Maps and are presented in the following table.

RECOMMENDED DESIGN ACCELERATIONS			
EVENT	Peak Ground Acceleration (PGA)	0.20-Second Acceleration (SD_s)	1.0-Second Acceleration (SD_1)
2% PE* in 50 Years	1.332g	1.365g	0.736g

*Probability of Exceedance

LIQUEFACTION ANALYSIS

A study was performed to determine the liquefaction and dynamic settlement potential at the site. Both field and laboratory data were used to perform the analysis. The field measurements included the depth of the water table and the SPT "N" values. The laboratory data included USCS soil classification, soil unit weight and percent fines of soil samples obtained from various strata. An earthquake magnitude (Mw) of 7.7 (probability of exceedance of 2% in 50 years, or 2,500-year return interval) was considered. A corresponding peak ground acceleration of 1.332g was determined using information provided in IBC 2012 and ASCE 7-10. For this analysis, groundwater was assumed to be at a depth of 13.5 feet below the ground surface.

Subsurface conditions (as characterized by the field and laboratory data) and earthquake characteristics were used to determine the safety factors against liquefaction in each soil layer, as well as the associated dynamic settlement during the design seismic event. Based on the analysis, there is liquefaction potential at the site. The analysis results are presented in the following table.

Please note that these settlement values are independent of and in addition to the static settlement resulting from structural loading.

Results of Liquefaction Analysis		
Boring	**Zones with Liquefaction Factor of Safety Less Than 1.0**	**Estimated Dynamic Settlement (in)**
B-4	13.5 to greater than 60	12 ¼

It is important to recognize the uncertainty regarding the depth of the liquefiable zones. The occurrence of significant liquefaction in relatively deep sand deposits (depths below 50 feet) is unlikely.

In general, liquefaction hazard mitigation can be accomplished using compaction piles (large displacement piles such as pipe piles driven closed-ended) or proprietary ground improvement techniques. Proprietary ground improvement techniques are typically performed by specialty firms on a design/build basis.

SITE GRADING

Very loose and soft soils were encountered within the upper 5 feet of Borings B-6, B-7 and B-8. These soils are not suitable for foundation or pavement support. The proposed building footprint and pavement areas should be cleared and stripped of all organic matter, foreign material, unsuitable soils and debris including foundations of the demolished buildings. The resulting subgrade should be proof-rolled with a loaded, tandem-axle dump truck or other construction equipment with similar weight. Areas observed to be unstable during the proof-roll should be undercut and replaced with suitable, compacted fill or stabilized as recommended by the geotechnical engineer. The following procedures are recommended for site preparation in cut and fill areas.

Cut Areas. In areas where cut will be required to bring the site to grade, the top 6 inches of the resulting subgrade should be compacted to a minimum of 95% of the maximum dry unit weight as determined by the standard Proctor test (ASTM D 698). If the cut areas are to support pavements, the top 12 inches should be compacted to a minimum of 100% of the maximum dry unit weight in the case of fine-grained soils or to a minimum of 75% of the relative density (ASTM D 4253 and D 4254) in the case of granular soils.

Preparation of Fill Areas. In areas where filling will be required to bring the site to grade, the following procedures are recommended.

a) Remove all organic matter, foreign material and debris.

b) Compact the top 6 inches of cleared subgrade to a minimum of 95% of the maximum dry unit weight as determined by the standard Proctor compaction test. If the subgrade is

granular material, compact the top 6 inches to a minimum of 70% relative density as determined by the relative density test ASTM D 4253 and D 4254.

Suitable Fill Materials. Fill material should consist of natural soils that have a maximum liquid limit of 45 and a plasticity index of not more than 20. Such materials should be free from organic matter, debris, or other deleterious materials, and have a maximum particle size of 2 inches.

Fill and Backfill Placement. Fill or backfill should be placed in lifts of uniform thickness and compacted. The compacted lift thickness, however, should generally not exceed 6 inches. Each lift should be compacted to a minimum of 95% of the maximum dry unit weight as determined by the standard Proctor test. Moisture content should be controlled to within ± 2% of optimum in building areas, and between optimum and -2% in pavement areas. If granular fill is used, compact each lift to a minimum of 70% of the relative density as determined by ASTM D 4253 and D 4254. Benching of existing slopes should be utilized before placement of new fill.

When fill is used to support pavements, the top 12 inches should be compacted to a minimum of 100% of the standard Proctor maximum dry unit weight in the case of fine-grained soils or to a minimum of 75% of the relative density in the case of granular soils. The underlying fill material should be compacted to a minimum of 95% of the standard Proctor maximum dry unit weight.

Trench Backfill. Settlement of utility trench backfill can result in unsightly depressions, and localized slab and pavement failures. Settlement of trench backfill can be reduced by compacting the backfill in lifts to the minimum compaction levels given herein. Permeable material, i.e., clean rock or sand, should not be used for backfill. Water can collect in permeable material, resulting in subgrade softening or in the migration of fines and loss of subgrade support.

Subgrade Protection. It is recommended that proper drainage of the construction areas be maintained to protect the prepared subgrade from the detrimental effects of weather conditions during construction. Finished subgrades and excavations should be kept free of standing water at all times.

Collection and Disposal of Site Water. Proper handling of the site water is important in the successful subgrade performance. Water from surface runoff and subsurface drains should be collected and discharged through an appropriately designed drainage system. Water should be drained away from the building.

Control of surface runoff should be maintained in compliance with the rules and regulations set forth in the Federal Water Pollution Control Act (1977). Additionally, any and all permits related to site grading activities and control of storm water during construction activities should be obtained from the appropriate governmental jurisdiction(s).

FOUNDATION RECOMMENDATIONS

Provided the unsuitable soils are removed as recommended in the Site Grading section of this report, spread footings may be proportioned for a maximum net allowable bearing pressure of 2,500 psf. For strip footings, a maximum net allowable bearing pressure of 2,300 psf can be used. If the structure is relocated, then additional subsurface exploration will be required to provide foundation recommendations at the new location. The minimum lateral dimensions for strip and spread footings should be 18 and 24 inches, respectively. We recommend that the footings bear a minimum of 18 inches below grade. An additional 6 inches of embedment is recommended if erosion of the cover material is not controlled. Once the foundation design is completed, the foundation plans should be forwarded for Geotechnology to review.

Exterior footings and footings in unheated interior areas should be embedded at least 12 inches below the lowest adjacent exterior grade to provide protection from seasonal moisture variations and frost penetration.

Silty soils such as those encountered in this exploration are easily disturbed. Footing excavations should be made with a smooth-edged backhoe bucket, and foot traffic in the bottom of the excavations should be minimized.

Total and differential settlement due to structural loading of footings, constructed as such, are not expected to exceed 1-inch and ¾-inch, respectively, for a maximum column load of 40 kips. These values are based on the condition that the existing loose and soft aoils are removed, replaced with controlled fill and the footing excavations are observed by the geotechnical engineer or his representatives. If column loads exceed 40 kips, Geotechnology should be notified to perform additional settlement analyses. Drainage away from the footings should be maintained throughout construction and throughout the life of the structure. Water should never be allowed to pond against the footings.

FLOOR SLABS

We recommend that floor slab be placed on a minimum of 3 feet of suitable material. Suitable material is defined as either newly compacted structural fill or stable, in situ soil. The floor should be underlain by a 4-inch layer of well-graded granular material compacted as specified in the Site Grading section. A 6-mil or thicker plastic sheet (moisture barrier) should be placed below the floor to reduce the potential for moisture to permeate the slab and to reduce the potential for mold growth in the building. The decision to utilize the moisture barriers shall be made in consultation with the structural engineer and architect. A modulus of subgrade reaction of 60 kcf can be used in floor slab design. However, it should not be sued to calculate the anticipated slab settlement.

Notwithstanding other structural considerations, the slab-on-grade floor should be designed to allow for differential movements that normally occur between the floor slab, columns, and foundation walls.

LATERAL EARTH PRESSURE

Backfill Materials. The construction of below-grade walls is anticipated. The excavations should extend upward from the bottom of the wall at an angle of 45 degrees. Select material refers to naturally occurring soil, which is reasonably well-graded and has a maximum particle size of 1.5 inches. The material should have a maximum of 6 percent passing the No. 200 sieve and the plasticity index (PI) should not exceed 10. The select material should be placed in lifts of approximately 12 inches and properly compacted. We recommend that the backfill material be capped with approximately 1 foot of compacted fine-grained soil with a PI of not greater than 20 and not less than 5. Fine-grained soils are not recommended as backfill. Walls should be sufficiently drained to remove water.

Lateral Earth Pressure. Conventional concrete walls can be designed for active earth pressures if the top of the wall is permitted to tilt (after construction) a minimum of 0.5 percent of the wall height. These walls are referred to as yielding walls. Rigid walls and walls with fixed heads, referred to as non-yielding walls, should be designed for at-rest earth pressures. A wing-wall, when attached to a fixed-head wall, should also be considered as a fixed-head wall, unless the structural design permits independent rotation. Static earth pressures can be assumed to act on the wall at a distance equal to one third of the wall height, measured from the base of the wall. Dynamic pressures and lateral pressures associated with surcharge loads should be considered to act horizontally at the midpoint of the wall. Presented in the following table are the design soil parameters for lateral earth pressures.

SOIL LATERAL EARTH PRESSURES – STATIC (NON-SEISMIC) CONDITIONS						
Description of Backfill	**Lateral Earth Pressure Parameters**					
	ϕ (°)	γ, moist unit weight (pcf)	Active Coefficient, K_a	At-Rest Coefficient, K_0	Passive Coefficient, K_p	Poisson's Ratio
Compacted Inorganic clays, low to medium plasticity (CL)	28	120	0.36	0.53	2.80	0.3 (unsaturated) 0.4-0.5 (saturated)
Well graded gravel-sand mix (GW/SW) (e.g. 1-inch-minus)	36	130	0.26	0.41	3.90	0.3-0.4
Poorly graded clean gravel or sand (GP/SP) (e.g. 1-inch-clean)	34	120	0.28	0.44	3.55	0.3

It is not recommended that passive earth pressure coefficients be used to calculate resistances to lateral loads near the ground surface due to the possibility that these soils may be disturbed during future excavation of utility lines.

Dynamic Lateral Forces on Yielding Walls. Design values, to be used in the Mononobe-Okabe Method, are provided in the following table, assuming a vertical wall with horizontal backfill and subject to active earth pressure conditions (other wall and backfill conditions will have different values). The backfill should be sufficiently drained so that hydrostatic pressures do not develop; otherwise, the walls should be designed to resist full hydrostatic pressures in the backfill.

Active lateral earth pressures will develop against yielding walls. Design lateral pressures from surcharge loads should be added to the lateral earth pressure loads.

SOIL LATERAL EARTH PRESSURES – MONONOBE-OKABE METHOD ONLY					
	Lateral Earth Pressure Parameters				
	ϕ (degrees)	γ, moist unit weight (pcf)	Dynamic Active Seismic Coefficient, K_{ae}	Dynamic Active Horizontal Seismic Coefficient, K_{aeh}	Dynamic Active Vertical Seismic Coefficient, K_{aev}
Compacted Inorganic clays, low to medium plasticity (CL)	28	120	0.73	0.69	0.23
Well graded gravel-sand mix (GW/SW) (e.g. 1-inch-minus)	36	130	0.69	0.64	0.27
Poorly graded clean gravel or sand (GP/SP) (e.g. 1-inch-clean)	34	120	0.68	0.62	0.28

The resultant is the total force (static + seismic) and can be placed at a height h above the bottom of the wall foundation calculated from the following equation:

$$h= (Pa*(H/3)+DPAE(0.6H))/PAE$$

where Pa = Active thrust on wall in static conditions
DPAE = Dynamic active earth pressure coefficient
H = wall height in feet (bottom of foundation to top of wall)

The seismic lateral loading force on retaining walls adjacent to level ground may be estimated using the following equation:

$$P_{AE} = \frac{1}{2} K_{AE} \gamma H^2$$

where P_{ae} = Total active thrust for seismic conditions
K_{AE} = Earthquake dynamic active earth pressure coefficient

γ = moist unit weight of soil
H = wall height in feet (bottom of foundation to top of wall)

The dynamic component of the total thrust, DPAE, is obtained by subtracting the static active thrust on wall in static conditions from the total active thrust.

Dynamic Lateral Forces on Non-Yielding Walls. The following method from Wood (1973) can be used to calculate the dynamic pressures on non-yielding walls. The dynamic thrust and dynamic overturning moment can be calculated using the Poisson's ratios from the previous table and the following equations:

$$\triangle P_{eq} = \gamma H^2 (A_h/g) * F_p$$

$$\triangle M_{eq} = \gamma H^3 (A_h/g) * F_m$$

Fp and Fm may be estimated using the charts developed by Wood (1973). These charts are found on Page 485 from the Geotechnical Earthquake Engineering by Kramer (1996). Poison's ratio and the unit weight (g) may be chosen from the referenced table. Ah/g may be taken as 0.463 based on the site-specific seismic study evaluating a seismic event with a 2% probability of exceedance in 50 years. The force should be applied at a height of DMeq/DPeq above the wall base, which is typically about 0.63H, where H is the height of the wall.

For the above equations to be valid for sand or gravel backfill, the backfill should be placed, in a wedge drawn upward and away from the edge of the wall footing at a 45-degree angle or flatter. If sand and gravel are to be placed within a steeper wedge, the values for low plasticity soil given in the previous table should be used.

Any soft, uncompacted soil on the excavation slope should be removed prior to placement of backfill. Design drawings should reflect this requirement. High plasticity clay should not be used as wall backfill.

PAVEMENT RECOMMENDATIONS

Pavements are to be placed on a minimum of 3 feet of suitable materials. Suitable subgrade materials for pavements are defined as either newly compacted structural fill or stable, in situ soil. The pavement subgrade should be prepared as recommended in the Site Grading section of this report. Once the subgrade is prepared, it should be promptly paved to protect it from the weather, as the naturally occurring soils of the area are susceptible to changes in moisture content. It is normal for the surficial soils to experience moisture content fluctuations, which may necessitate soil improvement in some cases, depending on the time of construction. The subgrade should be proof-rolled with a fully loaded dump truck and any unstable soils that develop should be replaced with compacted fill. Based on the results of the laboratory testing and correlations with the soil types encountered during this exploration a subgrade CBR of 3.0 was assumed for developing pavement recommendations.

The pavement sections presented in the following tables are based on assumed loading that is typical for the project size and usage. Please note that they are not associated with a predictable service life. The service life of the pavement will depend on the traffic volume that will use the facility and the thickness of different pavement layers.

Flexible Pavements. The flexible pavement recommendations provided in this section are based on the following assumed input parameters for the 1993 AASHTO pavement design method.

ASSUMED AASHTO FLEXIBLE PAVEMENT DESIGN PARAMETERS		
Pavement Type	Light-Duty	Heavy-Duty
Reliability	90%	90%
Standard Deviation	0.49	0.49
CBR	3.0	3.0
Soil Resilient Modulus	4,500 psi	4,500 psi
Estimated Equivalent Single Axle Loads (ESAL) over the Design Life of the Facility:	10,500	137,900
Drainage Coefficient	1.0	1.0
Initial Serviceability	4.2	4.2
Terminal Serviceability	2.0	2.0
Structural Number:	2.00	3.00

To arrive at the layer thicknesses presented below, a drainage coefficient of 1.0 was assumed.

FLEXIBLE PAVEMENT THICKNESS RECOMMENDATIONS*								
LAYER TYPE	Light-Duty Pavement				Heavy-Duty Pavement			
	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Asphalt Concrete	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0
Binder Course	1.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0
Black Base	5.0	-	-	-	5.0	-	-	-
Cement Treated Base	-	5.0	-	-	-	6.5	-	-
Crushed Stone	-	-	8.0	-	-	-	10.0	-
Soil Cement Base	-	-	-	7.0	-	-	-	10.0

*The materials should meet the requirements set forth in the applicable sections of the Standard Specifications for Highway Construction, latest edition, published by the Arkansas Highway and Transportation Department.

Rigid Pavements. The rigid pavement recommendations provided herein are based on the following assumed input parameters for the 1993 AASHTO pavement design method.

ASSUMED AASHTO RIGID PAVEMENT DESIGN PARAMETERS		
Pavement Type	Light-Duty	Heavy-Duty
Reliability	90%	90%
Standard Deviation	0.39	0.39
Composite Modulus of Subgrade Reaction	150 pci	150 pci
Estimated Equivalent Single Axle Loads (ESAL) over the Design Life of the Facility:	100,000	900,000
Initial Serviceability	4.5	4.5
Load Transfer Coefficient	3.2	3.2
Terminal Serviceability	2.0	2.0
Concrete 28-Day Strength	4,000 psi	4,000 psi
Concrete Modulus of Elasticity	3,600,000 psi	3,600,000 psi
Concrete Modulus of Rupture	600 psi	600 psi
Subbase Minimum Elastic Modulus	50,000 psi	50,000 psi

Rigid (concrete) Pavement- Minimum Concrete Strength 4,000 psi						
LAYER	Light-Duty Pavement			Heavy-Duty Pavement		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Portland cement concrete	6.0	6.0	6.0	8.0	8.0	8.0
Crushed Stone	-	-	7.0	-	-	7.0
CTB	4.0	-	-	4.0	-	-
Soil Cement Base	-	7.0	-	-	7.0	-

Rigid pavement should be equipped with load transfer (dowel) bars. The diameter of the dowel bars are typically equal to one eighth of the slab thickness (1 inch for the recommended for heavy duty pavements). The length of the bars should be a minimum of 18 inches (2 feet is preferable; 1 foot on each side of the joint). At expansion joints, the dowels should allow for the lateral movement of the slab due to expansion/contraction. At contraction joints, the depth of the reservoir should be ¼ the slab thickness. Refer to AASHTO or American Concrete Pavement Association for further recommendations and verification of the values presented above.

SECTION V – RECOMMENDED ADDITIONAL SERVICES

The conclusions and recommendations given in this report are based on interpretation of exploration data and Geotechnology's experience. The client must recognize that variations may occur from conditions observed in the borings, particularly within existing fills or previously developed areas. Design recommendations are based on data from borings, sampling and related procedures. Actual subsurface conditions may vary from those encountered in the borings. Therefore, design recommendations are subject to adjustment in the field, based on subsurface conditions encountered during construction. Test pits will be required in the area of the proposed structure to identify and delineate the depth and extent of unsuitable material and soft soils and to verify geotechnical design parameters. If the structure is relocated to another area of the site additional borings will be required to provide foundation recommendations at the new location.

We recommend that Geotechnology be retained to review foundation plans to observe that recommendations given in this report have been correctly implemented. Construction observation is intended to enhance compliance with project plans and specifications. It is not insurance, nor does it constitute a warranty or guarantee of any type. In all cases, contractors, et al, are solely responsible for the quality of their work and for adhering to plans and specifications.

SECTION VI – LIMITATIONS OF REPORT

This report has been prepared on behalf of and for the exclusive use of the client for specific application to the named project as described herein. If this report is provided to prospective contractors, the client should make it clear that the information is provided for factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions could require the expenditure of additional funds to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

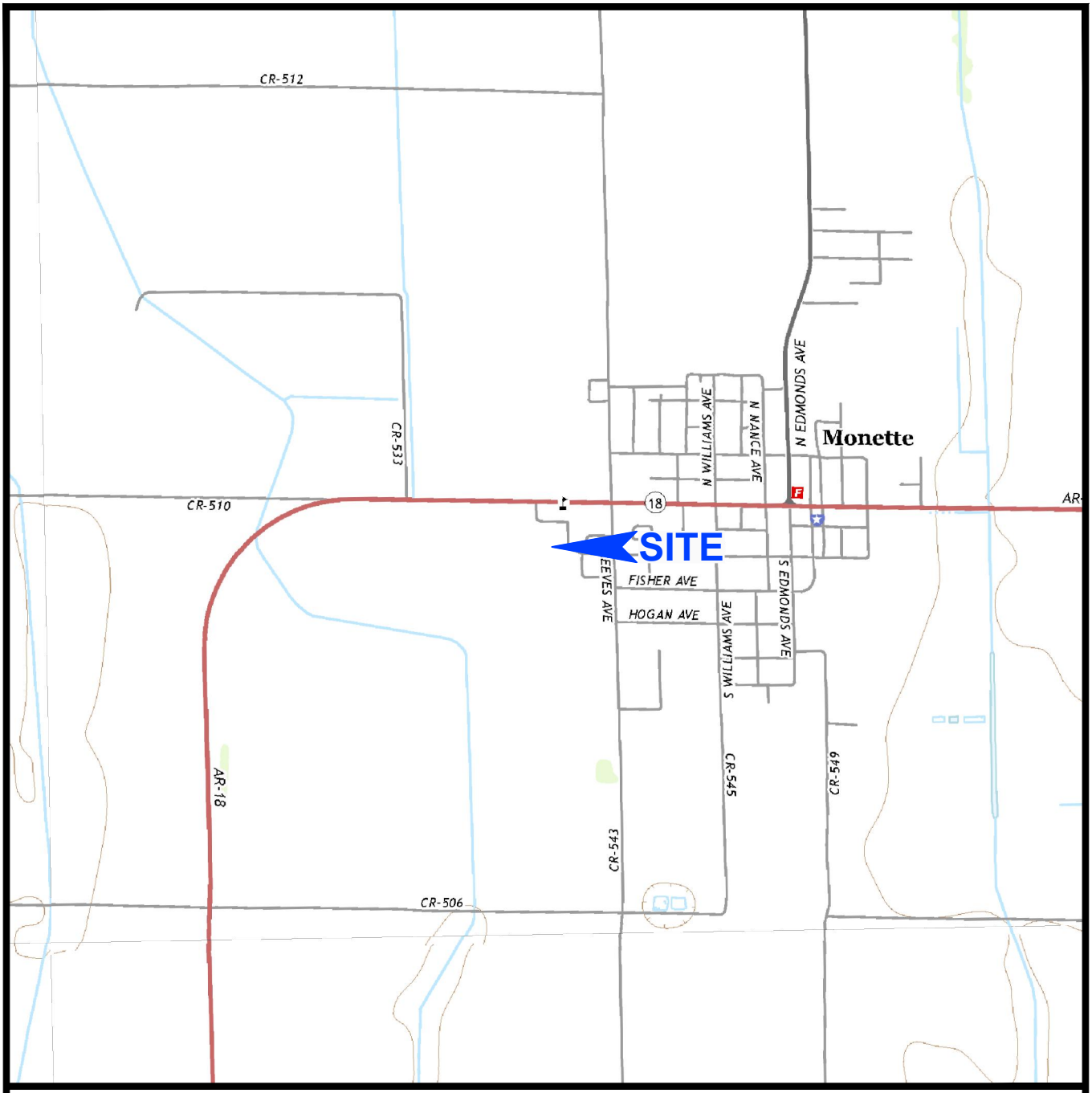
Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. No other representation, expressed or implied, is included or intended.

Unless specifically stated in our proposal or this report, the scope of our services for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic material in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope did not include any services to investigate or detect the presence of mold or any other biological contaminants (such as spores, fungus, bacteria, viruses, and the by-products of such organisms) on and around the site, or any services designed or intended to prevent or lower the risk of the occurrence of an infestation of mold or other biological contaminants.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Discrete sampling cannot be relied on to accurately reflect natural variations in stratigraphy that could exist between sample locations and/or intervals. Unless specifically noted, the scope of our services did not include an assessment of the effects of flooding and natural erosion of adjacent creeks or rivers on the project site.

The recommendations included in this report have been based in part on assumptions about natural variations in site stratigraphy that can only be completely evaluated during earthwork and foundation construction. Accordingly, Geotechnology should be retained to perform construction observation and complete its geotechnical engineering service using observational methods. Geotechnology cannot assume liability for the adequacy of its recommendations when they are used in the field without Geotechnology being retained to observe construction.

The conclusions or recommendations presented in this report should not be used if the nature, design, or location of the facilities is changed or if there is a substantial lapse in time between the submittal of this report and the start of work at the site. If changes are contemplated, Geotechnology must review them to assess their impact on findings, conclusions, and/or design recommendations given in this report. Geotechnology will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or reuse of the subsurface data or engineering analyses in this report without our express written authorization.



NOTES

1. Plan adapted from 7.5 minute U.S.G.S. maps for Leachville and Dixie, Arkansas-Missouri and Lake City and Caraway, Arkansas quadrangles last revised in 2014.

0 2,000 4,000

SCALE IN FEET

N

Drawn By: WAH	Ck'd By: PDB	App'vd By:
Date: 3-25-16	Date: 4-06-16	Date:

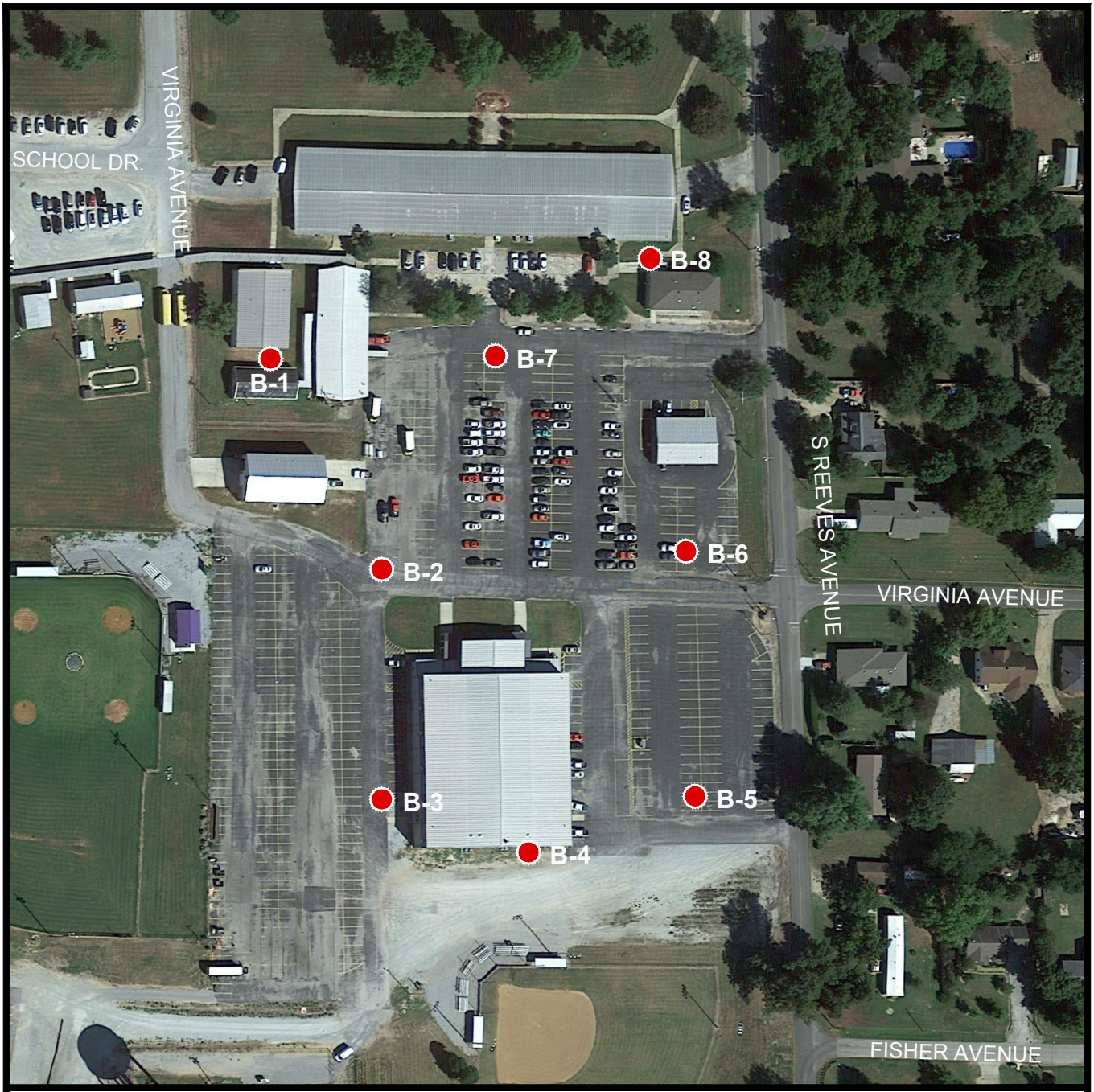
GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central Campus
805 West Drew Ave
Monette, Arkansas

SITE LOCATION AND TOPOGRAPHY

Project Number
J026679.01A

PLATE 1



NOTES

1. Plan adapted from a September 29, 2015 aerial photograph courtesy of Google Earth.

2. Borings were located in the field with reference to existing site features and are shown approximate only.

LEGEND

● Boring Location

0 150 300

SCALE IN FEET

N

Drawn By: WAH	Ck'd By: PDB	App'vd By:
Date: 3-25-16	Date: 4-06-16	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central Campus
805 West Drew Ave
Monette, Arkansas

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number
J026679.01A

PLATE 2

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX B

LOGS OF BORINGS: BORINGS B-1 THROUGH B-8

BORING LOG: TERMS AND SYMBOLS

Surface Elevation: _____ Completion Date: 3/2/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	TOPSOIL: 3 inches			
	Loose, brown and tan, silty SAND with clay - SM		4-2-4	SS1
5	Medium stiff, brown and tan, sandy CLAY, trace organics - CL		2-2-3	SS2
	Loose, brown and gray, clayey SAND, trace organics - SC		4-3-3	SS3
10	Loose, brown and gray, silty, clayey SAND, trace organics - SC-SM ▽		3-4-4	SS4
15	Loose, brown and gray, silty SAND - SM		4-4-5	SS5
20			4-4-5	SS6
25			4-5-5	SS7
	Boring terminated at 25 feet.			
30				
35				
40				
45				
50				
55				
60				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 1

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC.0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/3/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	ASPHALT: 3 inches			
	Medium stiff to stiff, brown and gray CLAY, trace organics - (CL)		1-2-3	SS1
5			97	ST2
	Loose to medium dense, brown and gray to gray, silty SAND - SM		4-5-5	SS3
	with clay		2-4-5	SS4
10	trace organics			
			0-3-5	SS5
15				
			5-4-4	SS6
20				
			5-5-10	SS7
25	Boring terminated at 25 feet.			
30				
35				
40				
45				
50				
55				
60				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 2

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC.0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/2/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	ASPHALT: 3 inches			
	Medium stiff, brown and gray SILTY CLAY, trace organics - (CL-ML)		3-2-3	SS1
				ST2
5	Loose to medium dense, brown and gray, silty SAND - SM		4-5-5	SS3
	with clay		2-4-6	SS4
10		▽		
15			4-4-5	SS5
20			8-8-8	SS6
	trace organics		6-9-12	SS7
25	Boring terminated at 25 feet.			
30				
35				
40				
45				
50				
55				
60				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 3

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC.0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/3/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	TOPSOIL: 7 inches			
	Hard to medium stiff, brown and gray to gray CLAY, trace organics - (CL)		104	ST1
5			3-4-6	SS2
	trace sand		3-4-7	SS3
	trace sand		2-2-3	SS4
10				ST5
	Loose to medium dense, gray to brown and gray SAND with SILT, trace organics - (SP-SM)		3-3-4	SS6
15	7.5 percent passing the No. 200 sieve			
			4-9-8	SS7
20				
			9-11-13	SS8
25				
	trace gravel		8-10-12	SS9
30				
	Medium dense, brown and gray SAND - (SP)		6-8-10	SS10
35				
	1.6 percent passing the No. 200 sieve		4-5-8	SS11
40				
			5-7-10	SS12
45				
	trace clay		9-10-14	SS13
50				
	3.9 percent passing the No. 200 sieve		9-11-14	SS14
55				
			10-12-16	SS15
60	Boring terminated at 60 feet.			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM 15 FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 4

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC 0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/2/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	ASPHALT: 4 inches			
	Medium dense to loose, brown and red to brown, silty SAND with clay - (SM)		6-6-7	SS1
5	trace gravel		2-2-3	SS2
	trace gravel		2-3-4	SS3
	30.9 percent passing the No. 200 sieve		2-2-3	SS4
10				
15	Medium dense, brown to gray SAND - SP		3-5-7	SS5
20			0-5-7	SS6
25	Medium dense, brown and gray, silty SAND, trace organics - SM		4-7-9	SS7
	Boring terminated at 25 feet.			
30				
35				
40				
45				
50				
55				
60				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 5

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC.0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/3/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	ASPHALT: 3 inches			
	BASE: 2 inches		2-2-2	SS1
	Very loose, brown, red and gray, clayey SAND, trace organics - SC		2-1-2	SS2
5				
	Loose to medium dense, gray to brown and tan, silty SAND - SM		4-5-6	SS3
	with clay		3-4-5	SS4
10	with clay			
	with organics	▽	2-4-3	SS5
15				
	with clay, trace organics		4-5-11	SS6
20				
			8-10-13	SS7
25	Boring terminated at 25 feet.			
30				
35				
40				
45				
50				
55				
60				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 6

Project No. J026679.01A

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC.0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/3/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	ASPHALT: 3 inches			
	Fill: sub-base: 3 inches		2-2-2	SS1
	Soft, brown, silty CLAY - CL			
5	Stiff, brown and gray, sandy CLAY - CL		2-5-5	SS2
	Loose, brown and tan to brown, silty SAND - SM		3-4-6	SS3
10	Boring terminated at 10 feet.		3-4-6	SS4
15				
20				
25				
30				
35				
40				
45				
50				
55				
60				

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 7

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC 0638301.GPJ 4/6/16

Surface Elevation: _____ Completion Date: 3/3/16

Datum _____

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	TOPSOIL: 3 inches			
	Soft, brown and gray CLAY, trace organics - (CL)		1-1-3	SS1
5	Medium stiff, brown and gray, sandy CLAY - CL		1-2-3	SS2
				ST3
10	Loose, brown, silty SAND - SM		2-4-6	SS4
	Boring terminated at 10 feet.			

SHEAR STRENGTH, tsf

△ - UU/2 ○ - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 3 3/4 HOLLOW STEM

WASHBORING FROM ___ FEET

JSW DRILLER BND LOGGER

Mobile B58 DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: ABM	Checked by:	App'vd. by:
Date: 3/9/16	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Buffalo Island Central
Monette Campus

LOG OF BORING: B- 8

Project No. J026679.01A

LOG OF BORING 2002.WL J026679.01A MONETTE.GPJ GTINC 0638301.GPJ 4/6/16

BORING LOG: TERMS AND SYMBOLS

GENERAL NOTES

1. *Information on each boring log is a compilation of subsurface conditions based on soil or rock classifications obtained from the field as well as from laboratory testing of samples. The strata lines on the logs may be approximate or the transition between the strata may be gradual rather than distinct. Water level measurements refer only to those observed at the times and places indicated, and may vary with time, geologic condition or construction activity.*
2. *Relative composition and Unified Soil Classification designations are based on visual estimates and are approximate only. If laboratory tests were performed to classify the soil, the unified designation is show in parenthesis.*
3. *Value given in Unit Dry Weight/SPT Column is either a unit dry weight in pounds per cubic foot, if adjacent to a ST sample designation, or blows per 6-inch increment if adjacent to a SS sample designation.*

ABBREVIATIONS

UU/2	*Shear Strength from Unconsolidated – Undrained Triaxial Test (ASTM D2850)*
QU/2	*Shear Strength from Unconfined Compression Test (ASTM D2166)*
SV	*Shear Strength from Field Vane (ASTM D2573)*
PL	*Plastic Limit (ASTM D4318)*
LL	*Liquid Limit (ASTM D4318)*

LEGEND

CS	Continuous Sampler
GB	Grab Sample Taken From Auger Cuttings Or Wash Water Return
NX 100/42	NX Rock Core with Percent Recovery/R.Q.D. Given In Adjacent Column
PST	Three Inch Diameter Piston Tube Sample
SS	Split Spoon Sample (Standard Penetration Test)
ST	Three Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
SV	Field Vane Test

SPLIT – BARREL SAMPLER DRIVING RECORD

Blow Per Foot (N-Value)	*Description*
25	*25 blows drove sampler 12 inches after initial 6 inches of seating.*
75/10”	*75 blows drove sampler 10 inches after initial 6 inches of seating.*
50/S3”	*50 blows drove sampler 3 inches during initial 6 inch seating interval.*

NOTES: 1. To avoid damage to sampling tools, driving is limited to 50 blows during any six inch interval.
2. N-Value (Blow Count) is the standard penetration resistance based on the total number of blows, using a 140-lb hammer with 30-inch free fall, required to drive a split spoon the last two of three, 6-inch drive increments. (Example: 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on grid plot and may be shown as 4/7/9 in Unit Dry Weight – SPT column.

RELATIVE COMPOSITION

Trace……...0-10 %
With/Some……...11-35 %
Soil modifier such…... > 35 %
As silty, clayey, sandy, etc.

DENSITY OF GRANULAR SOILS

Descriptive Term:	***N—Value***
Very Loose	*0 - 4*
Loose	*5 - 10*
Medium Dense	*11 - 30*
Dense	*31 - 50*
Very Dense	*> 50*

STRENGTH OF COHESIVE SOILS

Consistency	**Undrained Shear Strength Tons Per Sq. Ft.**	**Field Test**	**Approximate N-Value Range**
Very Soft	*less than 0.12*	*Thumb will penetrate soil more than 1”*	*0 - 1*
Soft	*0.13 to 0.25*	*Thumb will penetrate soil about 1”*	*2 - 4*
Medium Stiff	*0.26 to 0.50*	*Thumb will penetrate soil about ¼”*	*5 – 8*
Stiff	*0.51 to 1.00*	*Thumb hardly indents soil*	*9 – 15*
Very Stiff	*1.01 to 2.00*	*Thumb will not indent soil, but readily indented with thumbnail*	*16 – 30*
Hard	*greater than 2.00*	*Thumbnail will not indent soil*	*> 30*

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

12”	3”	¾“	4	10	40	200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		
300	76.2	19.1	4.76	2.00	0.42	0.074	0.002	

SOIL GRAIN SIZE IN MILLIMETERS

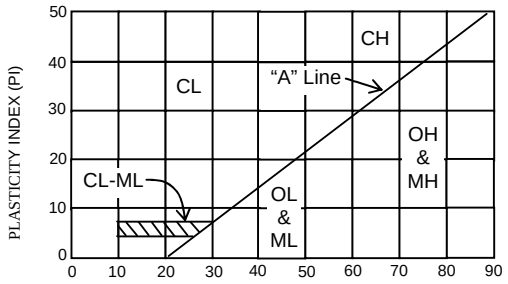
SOIL STRUCTURE

Calcareous *– Having appreciable quantities of carbonate.*
Fissured *– Containing shrinkage or relief cracks, often filled with sand or silt; usually more or less vertical.*
Slickensided *– Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along those planes.*
Layer *-- Inclusion greater than 3 inches thick.*
Seam *– Inclusion 1/8 inch to 3 inches thick extending through the sample*
Parting *– Inclusion less than 1/8 inch thick.*
Pocket *– Inclusion of material of different texture that is smaller than the diameter of the sample.*
Interlayered *– Soil samples composed of alternating layers of different soil types.*
Intermixed *– Soil samples composed of pockets of different soil types and a layered or laminated structure is not evident.*
Laminated *– Soil sample composed of alternating partings or seams of different soil type.*

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	DESCRIPTION
Coarse-Grained Soils (More than 50% Larger than No 200 Sieve Size)	Gravel and Gravelly Soils	Clean Gravels Little or no Fines	GW	Well-Graded Gravel, Gravel-Sand Mixture
			GP	Poorly –Graded Gravel, Gravel-Sand Mixture
		Gravels with Appreciable Fines	GM	Silty Gravel, Gravel-Sand-Silt Mixture
			GC	Clayey-Gravel, Gravel-Sand-Clay Mixture
	Sand and Sandy Soils	Clean Sands Little or no Fines	SW	Well-Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sands with Appreciable Fines	SM	Silty Sand, Sand-Silt Mixture
			SC	Clayey Sand, Sand-Clay Mixture
Fine-Grained Soils (More than 50% Smaller than No 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	ML	Silt, Clayey Silt, Silty or Clayey Very Fine Sand, Slight Plasticity
			CL	Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity
			OL	Organic Silts, or Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit More Than 50	MH	Silt, Fine Sandy or Silt Soil with High Plasticity
			CH	Clay, High Plasticity
			OH	Organic Clay of Medium to High Plasticity
	Highly Organic Soils		PT	Peat, Humus, Swamp Soil

PLASTICITY CHART



RELATIVE PLASTICITY

Nonplastic	Cannot Roll Into Ball
Trace Plasticity	Barely Roll Into Ball
Medium Plastic	Can be Rolled Into Ball
Highly Plastic	No Rupture by Kneading

VISUAL DESCRIPTION CRITERIA*

TABLE 1: CRITERIA FOR DESCRIBING ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

TABLE 2: CRITERIA FOR DESCRIBING PARTICLE SHAPE

Description	Criteria
Flat	Particles with width/thickness X3
Elongated	Particles with length/width X3
Flat and Elongated	Particles meet criteria for both flat and elongated

TABLE 3: CRITERIA FOR DESCRIBING MOISTURE CONDITION

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible free water, usually soil is below the water table

TABLE 4: CRITERIA FOR DESCRIBING REACTION WITH HCL

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming rapidly

TABLE 6: CRITERIA FOR DESCRIBING CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

NOTES: 1. Tables adapted from ASTM D2488 "Description and identification of Soils" (Visual-Manual Procedure)
2. Tables 5, 7 and 11 incorporated into other information on this plate.

TABLE 8: CRITERIA FOR DESCRIBING DRY STRENGTH

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and a hard surface

TABLE 9: CRITERIA FOR DESCRIBING DILATANCY

Description	Criteria
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

TABLE 10: CRITERIA FOR DESCRIBING TOUGHNESS

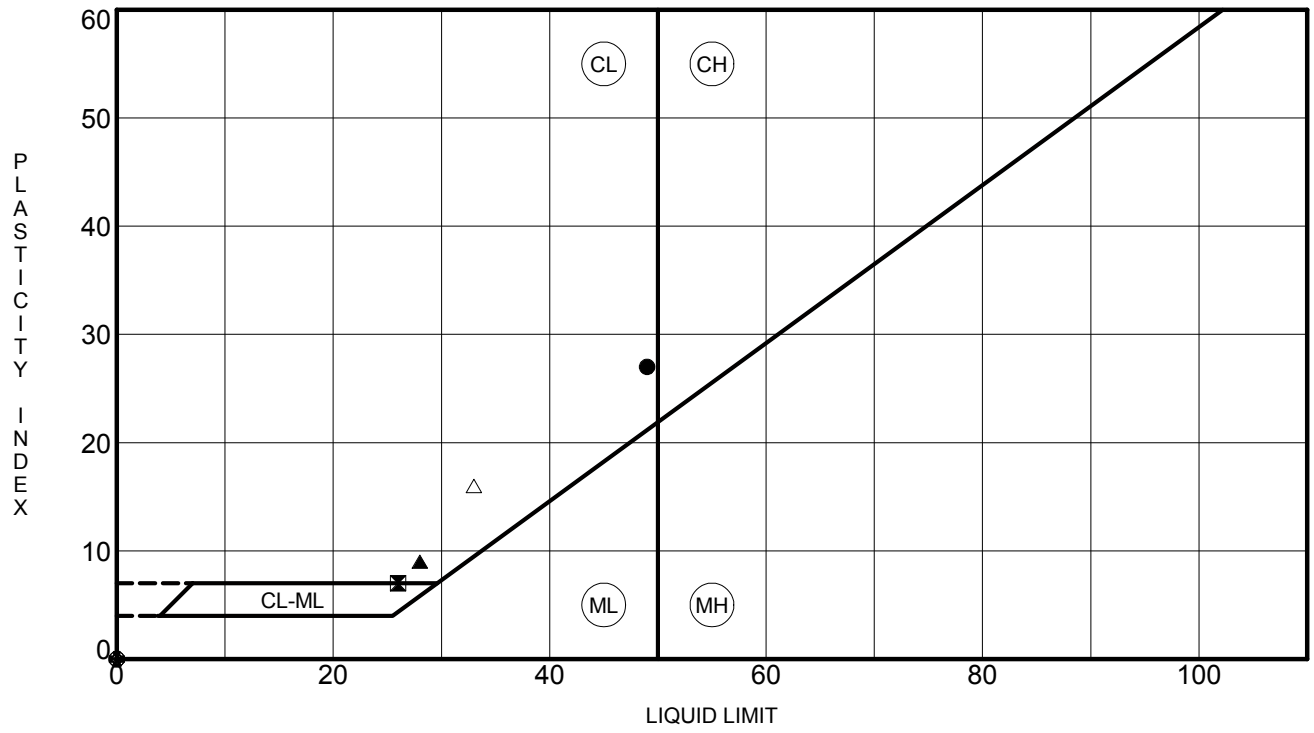
Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness

TABLE 12: IDENTIFICATION OF INORGANIC FINE-GRAINED SOILS FROM MANUAL TESTS

Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	none	High

APPENDIX C

LABORATORY TEST RESULTS



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B- 2	3.0	49	22	27		LEAN CLAY(CL)
⊠	B- 3	1.0	26	19	7		SILTY CLAY(CL-ML)
▲	B- 4	1.0	28	19	9		LEAN CLAY(CL)
★	B- 4	13.5	NP	NP	NP	8	POORLY GRADED SAND with SILT(SP-SM)
⊙	B- 4	38.5	NP	NP	NP	2	POORLY GRADED SAND(SP)
✿	B- 4	53.5	NP	NP	NP	4	POORLY GRADED SAND(SP)
○	B- 5	3.5	NP	NP	NP	31	SILTY SAND(SM)
△	B- 8	1.0	33	17	16		LEAN CLAY(CL)

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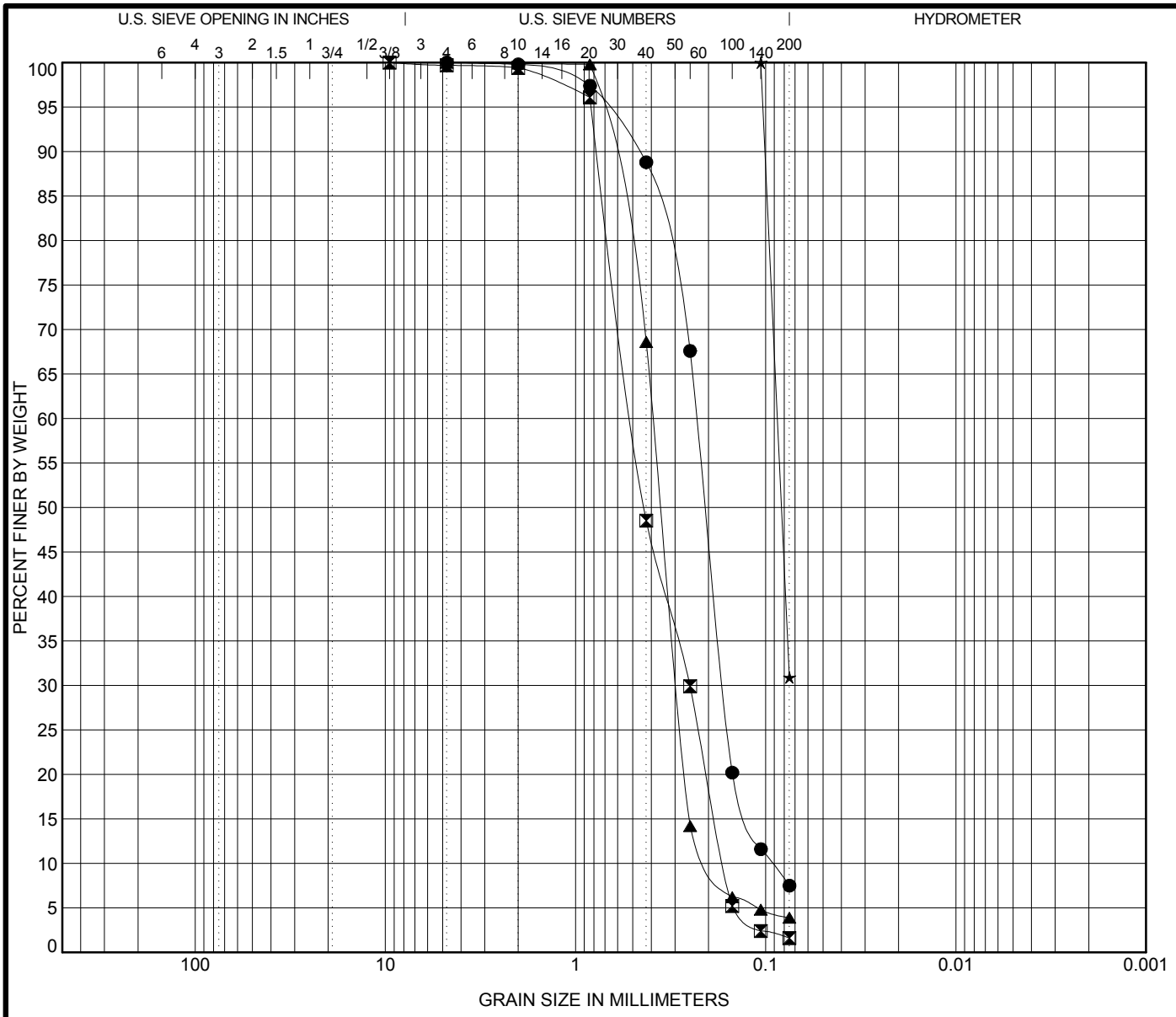
ATTERBERG LIMITS RESULTS

Buffalo Island Central
Monette Campus
J026679.01A

US_ATTERBERG_LIMITS_J026679.01A MONETTE.GPJ US_LAB.GDT 4/6/16



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B- 4	13.5	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.30	2.49
⊠	B- 4	38.5	POORLY GRADED SAND(SP)	NP	NP	NP	0.76	3.02
▲	B- 4	53.5	POORLY GRADED SAND(SP)	NP	NP	NP	1.14	2.04
★	B- 5	3.5	SILTY SAND(SM)	NP	NP	NP		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B- 4	13.5	4.75	0.23	0.167	0.093	0.0	92.5	7.5	
⊠	B- 4	38.5	9.5	0.501	0.251	0.166	0.3	98.1	1.6	
▲	B- 4	53.5	4.75	0.391	0.292	0.191	0.0	96.1	3.9	
★	B- 5	3.5	0.106	0.087			0.0	69.1	30.9	

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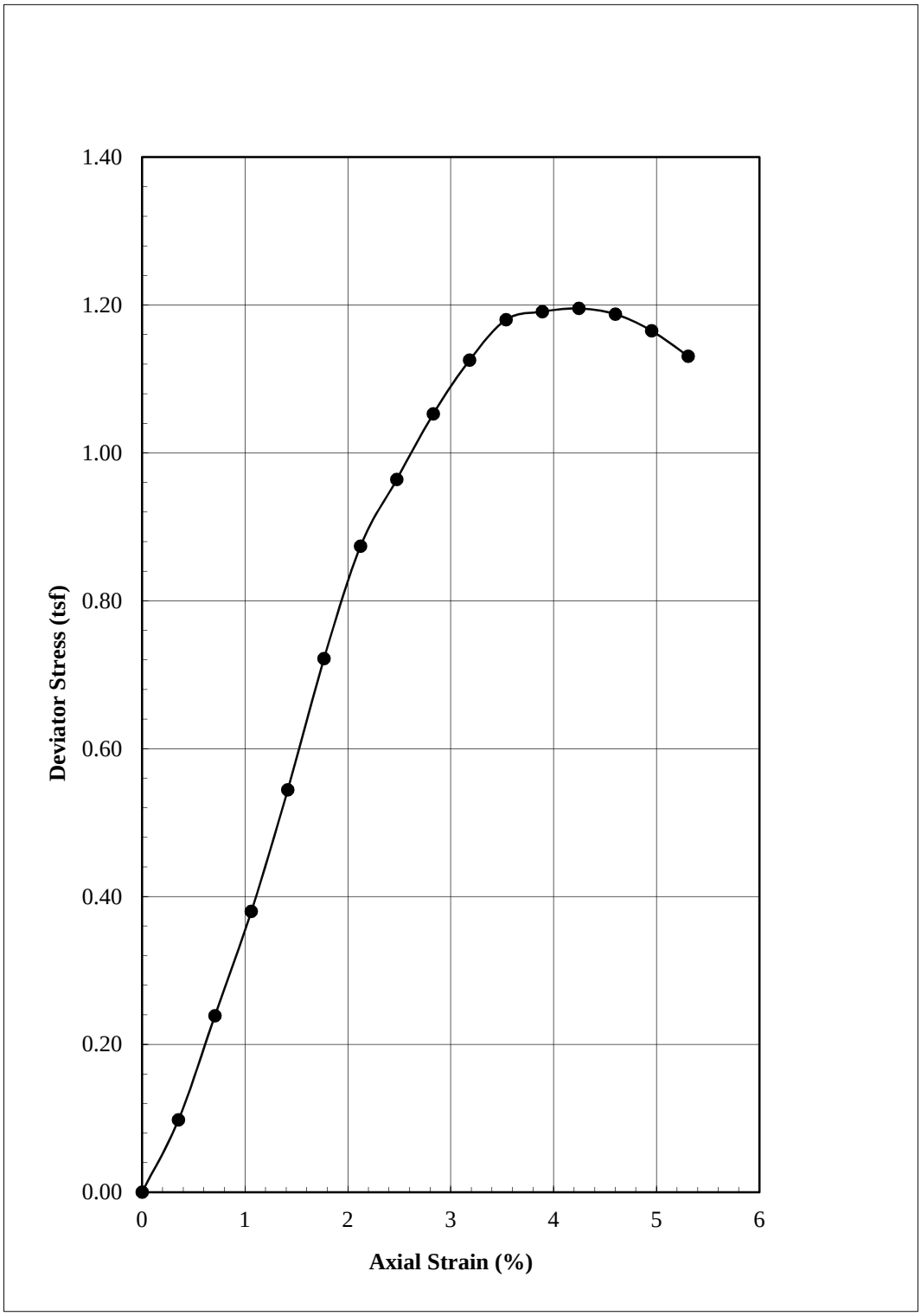
FROM THE GROUND UP

GRAIN SIZE DISTRIBUTION

Buffalo Island Central
Monette Campus
J026679.01A

US_GRAIN_SIZE_J026679.01A MONETTE.GPJ US_LAB.GDT 4/6/16



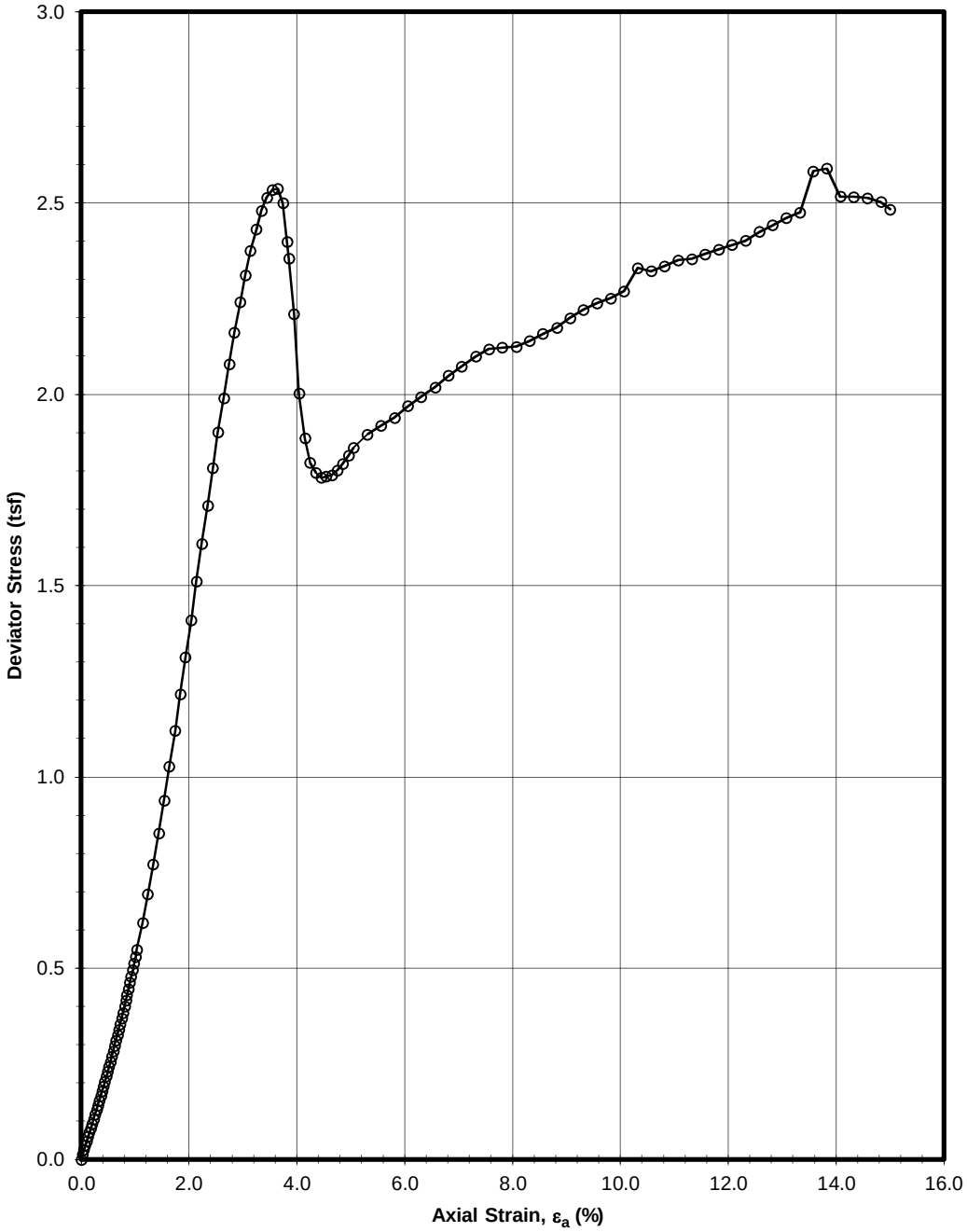
UNCONFINED COMPRESSION TEST

ASTM D 2166

Project No.: J026679.01

Boring: B-2

Sample: ST-1 - Depth: 3 ft.



UNCONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

ASTM D 2850

Project No.: J026679.01

Boring: B-4

Sample: ST-1 - Depth: 1 ft.

SECTION 00 50 00

CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.01 CONTRACTOR IS RESPONSIBLE FOR OBTAINING A VALID LICENSE TO USE ALL COPYRIGHTED DOCUMENTS SPECIFIED BUT NOT INCLUDED IN THE PROJECT MANUAL.

1.02 AGREEMENT AND CONDITIONS OF THE CONTRACT

A. The Agreement is based on AIA A133 , as amended.

B. The General Conditions are based on AIA A201, as amended.

1.03 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.

B. Bond Forms:
   1. Performance Bond and Payment Bond Form: AIA A312, as amended.

C. Post-Award Certificates and Other Forms:
   1. Agreement Between Contractor and Subcontractor: AIA A401, or approved equivalent.
   2. Submittal Transmittal Form: AIA G810, or approved equivalent form.
   3. Schedule of Values Form: AIA G703, or approved equivalent form.
   4. Application for Payment Form: AIA G702 and G703, or approved equivalent form.

D. Clarification and Modification Forms:
   1. Request for Interpretation Form: AIA G716, or approved equivalent form.
   2. Clarification Form: AIA G716, or approved equivalent form.
   3. Substitution Request Form: Section 016001, or approved equivalent form.
   4. Supplemental Instruction Form: AIA G710, or approved equivalent form.
   5. Request for Proposal Form: AIA G709 or approved equivalent form.
   6. Change Order Form: AIA G701, or approved equivalent form.

E. Closeout Forms:
   1. Certificate of Substantial Completion Form: AIA G704, or approved equivalent form.
   2. Contractor's Affidavit of Payment of Debts and Claims Form: AIA G706, or approved equivalent form.
   3. Contractor's Affidavit of Release of Liens Form: AIA G706A, or approved equivalent form.

F. In general AIA Contract Documents Series forms, or approved equivalents, may be used for forms not otherwise indicated.

G. AIA Documents Paper Copies: www.aiaar.org, telephone: (501) 661-1111, fax: (501) 372-4505, or www.aia.org docspurchases@aia.org.

1.04 REFERENCE STANDARDS

A. AIA A133 - Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price; 2009.

B. AIA A201 - General Conditions of the Contract for Construction; 2007.

C. AIA A312 - Performance Bond and Payment Bond; 2010.

D. AIA A401 - Standard Form of Agreement Between Contractor and Subcontractor; 2007.

E. AIA C106 - Digital Data Licensing Agreement; 2007.

F. AIA E201 - Digital Date Protocol Exhibit; 2007.

G. AIA G701 - Change Order; 2001.

H. AIA G702 - Application and Certificate for Payment; 1992.

I. AIA G703 - Continuation Sheet; 1992.

J. AIA G704 - Certificate of Substantial Completion; 2000.

K. AIA G705 - List of Subcontractors; 2001.

L. AIA G706 - Contractor's Affidavit of Payment of Debts and Claims; 1994.

M. AIA G707 - Consent of Surety to Final Payment; 1994.

N. AIA G709 - Proposal Request; 2001.

O. AIA G710 - Architect's Supplemental Instructions; 1992.

P. AIA G716 - Request for Information; 2004.

Q. AIA G810 - Transmittal Letter; 2001.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 52 00
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

A. Contract Type: A single prime contract based on the Cost of the Work plus a fee.
   1. AIA A133 - Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price; 2009, as amended.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF AGREEMENT FORM

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AIA® Document A133™ – 2009

Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price

AGREEMENT made as of the 19th day of April in the year 2016
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status and address)

Buffalo Island Central School District
801 W. Drew St.
Monette, AR 72447

and the Construction Manager:
(Name, legal status and address)

Nabholz
3415 One Place
Jonesboro, AR 72404

for the following Project:
(Name and address or location)

Buffalo Island Central K-12 Buildings

The Architect:
(Name, legal status and address)

Little & Associates Architects in Partnership with
Cromwell Architects Engineers, Inc.
501 Union Avenue
Jonesboro, AR 72401

The Owner's Designated Representative:
(Name, address and other information)

Gaylon Taylor
801 W. Drew St.
Monette, AR 72447

The Construction Manager's Designated Representative:
(Name, address and other information)

Adam Seiter
3415 One Place
Jonesboro, AR 72404
870-934-4854

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Architect's Designated Representative:
(Name, address and other information)

John Mixon
505 Union Street 2nd Floor
Jonesboro, AR 72401
870-336-0536

The Owner and Construction Manager agree as follows.

TABLE OF ARTICLES

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 The Contract Documents

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. Upon the Owner's acceptance of the Construction Manager's Guaranteed Maximum Price proposal, the Contract Documents will also include the documents described in Section 2.2.3 and identified in the Guaranteed Maximum Price Amendment and revisions prepared by the Architect and furnished by the Owner as described in Section 2.2.8. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. If anything in the other Contract Documents, other than a Modification, is inconsistent with this Agreement, this Agreement shall govern.

§ 1.1.1 Construction Manager shall exercise the degree of care, skill and diligence in the performance of the Construction Manager's Work, to assure its Work is performed in a good and workmanlike manner, consistent with construction industry standards for similar projects and circumstances in the same geographic area (hereinafter the "Construction Manager's Standard of Care"). The Construction Manager shall be responsible for and have control over all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Construction Manager's Work under this Agreement, including all coordination of the duties of all trades, and shall furnish efficient business administration and supervision of the Work.

Construction Manager's Standard of Care specifically excludes any design or design-related responsibilities, and any action taken by Construction Manager under this Agreement does not and shall not be construed to approve, represent or warrant the adequacy and suitability of the plans and specifications for the purpose for which they are provided.

§ 1.1.2 To the extent the Owner requests that the Construction Manager provide services within standard of care, such as value analysis and/or constructability suggestions or comments with respect to the Drawings and Specifications, Owner acknowledges that such services are advisory only and not professional design services. The Owner shall refer all suggestions and comments to the Architect or other design professionals for review and evaluation prior to Owner's acceptance thereof. The Owner further acknowledges that the Construction Manager is

not responsible for adequacy of the drawings and specifications or for confirming the absence of errors or omissions that may exist therein. The Owner shall cause the Architect to revise the Drawings and Specifications to reflect all value analysis and constructability suggestions and comments accepted by the Owner without delay or disruption to the timely and orderly progress of the work. The contract sum and contract time may be adjusted upon the Contractor's review and pricing of the revised Drawings and Specifications.

§ 1.2 Relationship of the Parties

The Construction Manager accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Construction Manager's skill and judgment in furthering the interests of the Owner; to furnish efficient construction administration, management services and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner's interests. The Owner agrees to furnish or approve, in a timely manner, information required by the Construction Manager and to make payments to the Construction Manager in accordance with the requirements of the Contract Documents.

§ 1.3 General Conditions

For the Preconstruction Phase, AIA Document A201™–2007 (as amended), General Conditions of the Contract for Construction, shall apply only as specifically provided in this Agreement. For the Construction Phase, the general conditions of the contract shall be as set forth in A201–2007 (as amended), which document is incorporated herein by reference. The term "Contractor" as used in A201–2007 (as amended) shall mean the Construction Manager.

ARTICLE 2 CONSTRUCTION MANAGER'S RESPONSIBILITIES

The Construction Manager's Preconstruction Phase responsibilities are set forth in Sections 2.1 and 2.2. The Construction Manager's Construction Phase responsibilities are set forth in Section 2.3. The Owner and Construction Manager may agree for the Construction Phase to commence prior to completion of the Preconstruction Phase, in which case, both phases will proceed concurrently. The Construction Manager shall identify a representative authorized to act on behalf of the Construction Manager with respect to the Project.

§ 2.1 Preconstruction Phase

§ 2.1.1 The Construction Manager shall provide a preliminary evaluation of the Owner's program, schedule and construction budget requirements, each in terms of the other.

§ 2.1.2 Consultation

The Construction Manager shall schedule and conduct meetings with the Architect and Owner to discuss such matters as procedures, progress, coordination, and scheduling of the Work. The Construction Manager shall advise the Owner and the Architect on proposed site use and improvements, selection of materials, and building systems and equipment. The Construction Manager shall also provide recommendations consistent with the Project requirements to the Owner and Architect on constructability; availability of materials and labor; time requirements for procurement, installation and construction; and factors related to construction cost including, but not limited to, costs of alternative designs or materials, preliminary budgets, and possible cost reductions.

§ 2.1.3 When Project requirements in Section 3.1.1 have been sufficiently identified, the Construction Manager shall prepare and periodically update a Project schedule for the Owner's acceptance. The Construction Manager shall obtain the Architect's approval for the portion of the Project schedule relating to the performance of the Architect's services. The Project schedule shall coordinate and integrate the Construction Manager's services, the Architect's services, other Owner consultants' services, and the Owner's responsibilities and identify items that could affect the Project's timely completion. The updated Project schedule shall include the following: completion of various elements of the Architect's work, submission of the Guaranteed Maximum Price proposal; components of the Work; times of commencement and completion required of each Subcontractor (or appropriate breakdown of the Work); ordering and delivery of products, including those that must be ordered in advance of construction (if such products are known by or communicated to the Construction Manager) and the occupancy requirements of the Owner.

§ 2.1.4 Phased Construction

The Construction Manager shall provide recommendations with regard to accelerated or fast-track scheduling, procurement, or phased construction. The Construction Manager shall take into consideration cost reductions, cost information, constructability, provisions for temporary facilities and procurement and construction scheduling issues.

§ 2.1.5 Preliminary Cost Estimates

§ 2.1.5.1 Based on the preliminary design and other design criteria prepared by the Architect, the Construction Manager shall prepare preliminary estimates of the Cost of the Work or the cost of program requirements using area, volume or similar conceptual estimating techniques for the Architect's review and Owner's approval. If the Architect or Construction Manager suggest alternative materials and systems, the Construction Manager shall provide cost evaluations of those alternative materials and systems.

§ 2.1.5.2 As the Architect progresses with the preparation of the Schematic Design, Design Development and Construction Documents, the Construction Manager shall prepare and update, at appropriate intervals agreed to by the Owner and Construction Manager, estimates of the Cost of the Work of increasing detail and refinement until such time as the Owner and Construction Manager agree on a Guaranteed Maximum Price for the Work. Such estimates shall be provided for the Architect's review and the Owner's approval. The Construction Manager shall inform the Owner and Architect when estimates of the Cost of the Work exceed the latest approved Project budget and make recommendations for corrective action.

§ 2.1.6 Subcontractors and Suppliers

The Construction Manager shall develop bidders' interest in the Project.

§ 2.1.7 Extent of Responsibility

The Construction Manager shall exercise reasonable care in preparing schedules and estimates. The Construction Manager, however, does not warrant or guarantee estimates and schedules except as may be included as part of the Guaranteed Maximum Price. The Construction Manager is not required to ascertain that the Drawings and Specifications are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Construction Manager shall promptly report to the Architect and Owner any nonconformity discovered by or made known to the Construction Manager as a request for information in such form as the Architect may require.

§ 2.1.8 Notices and Compliance with Laws

The Construction Manager shall comply with applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to its performance under this Contract, and with equal employment opportunity programs, and other programs as may be required by governmental and quasi governmental authorities for inclusion in the Contract Documents.

(Paragraphs deleted)

§ 2.2 Guaranteed Maximum Price Proposal and Contract Time

§ 2.2.1 When the Drawings and Specifications have been completed, the Construction Manager will solicit trade contractors for competitive bids in relevant trade categories. Upon completion of the bidding cycle, the Construction Manager shall propose a Guaranteed Maximum Price ("GMP"), which shall be the sum of the estimated cost of work, including contingencies described in Section 2.2.4 and the Construction Manager's Fee.

§ 2.2.2 The Owner and Construction Manager acknowledge that the Construction Manager will/has developed the Guaranteed Maximum Price based upon completed Contract Documents "CDs".

In the event that the Owner and Construction Manager agree that the Construction Manager will develop a Guaranteed Maximum Price before the completion of the Contract Documents (CDs), in that such Drawings and Specifications do not contain all details and requirements of the Work, the Guaranteed Maximum Price will be based on certain assumptions by the Construction Manager. To the extent that the Drawings and Specifications are anticipated to require further development by the Architect, the Construction Manager will include an allowance to be identified in the GMP Amendment for such further development consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not include such things as changes in scope, systems, kinds and quality of materials, finishes or equipment, or any condition which was not reasonably anticipated by the Construction Manager's assumptions regarding the completion of the design, all of which, if required shall be incorporated by Change Order for additional cost and/or time as required. If the Contract Documents (CDs) or final Drawings and Specifications require performance of the Work in any manner different from such assumptions, or contain changes in the scope of the Work to be performed by the Construction Manager, the Construction Manager shall as soon as practicable notify the Owner thereof and of the Construction Manager's

estimate of the resulting increase or decrease in the Guaranteed Maximum Price. At such time as the Owner and the Construction Manager have agreed upon the effect of such difference and/or changes in the scope of the Work, a Change Order shall be issued substituting the finished Contract Documents (CDs) for those described in this Agreement and the Guaranteed Maximum Price and Contract Time shall be adjusted as agreed by the parties.

§ 2.2.3 The Construction Manager shall include with the Guaranteed Maximum Price proposal a written statement of its basis, which shall include the following:

.1 A list of the Drawings and Specifications, including all Addenda thereto, and the Conditions of the Contract;

.2 A list of the clarifications and assumptions made by the Construction Manager in the preparation of the Guaranteed Maximum Price proposal, including assumptions under Section 2.2.2, to supplement the information provided by the Owner and contained in the Drawings and Specifications;

.3 A statement of the proposed Guaranteed Maximum Price, including a statement of the estimated Cost of the Work organized by trade categories or systems, allowances, contingency, and the Construction Manager's Fee;

.4 The anticipated date of Substantial Completion upon which the proposed Guaranteed Maximum Price is based;

.5 A date by which the Owner must accept the Guaranteed Maximum Price; and

.6 The Date of Commencement of the Work shall be within ten (10) days of receipt of 1) Owner's Notice to Proceed, 2) the issuance of all applicable permits, and 3) Proof of adequate financing for the Work by the Owner and/or Owner's lender (in a form suitable to the Construction Manager), whichever is later.

§ 2.2.4 The GMP shall contain a mutually agreeable and separately identified contingency (the "Construction Contingency") for the sole use by the Construction Manager. The Construction Contingency is not allocated to any particular item of the cost of the Work and is established for the Cost of the Work incurred by the Construction Manager, including mitigation of weather impact, losses, expenses or damages not covered by insurance or bonds, low estimates or deviations from the estimated cost and overly aggressive scheduling or shortage of properly skilled workforce. It is understood by the Parties that this contingency is not to be allocated to costs due to errors and omissions in the Contract Documents (CDs) or to remedy, correct or resolve any inconsistencies, ambiguities, errors or omissions contained within the Architect's work product on which the Construction Manager's Guaranteed Maximum Price was based.

§ 2.2.5 The Construction Manager shall meet with the Owner to review the Guaranteed Maximum Price proposal. In the event that the Owner and Architect discover any inconsistencies or inaccuracies in the information presented, they shall promptly notify the Construction Manager, who shall make appropriate adjustments to the Guaranteed Maximum Price proposal, its basis, or both.

§ 2.2.6 If the Owner notifies the Construction Manager that the Owner has accepted the Guaranteed Maximum Price proposal in writing before the date specified in the Guaranteed Maximum Price proposal, the Guaranteed Maximum Price proposal shall be deemed effective without further acceptance from the Construction Manager. Following acceptance of a Guaranteed Maximum Price, the Owner and Construction Manager shall execute the Guaranteed Maximum Price Amendment amending this Agreement, a copy of which the Owner shall provide to the Architect. The Guaranteed Maximum Price Amendment shall set forth the agreed upon Guaranteed Maximum Price with the information and assumptions upon which it is based.

§ 2.2.7 Prior to the Owner's acceptance of the Construction Manager's Guaranteed Maximum Price proposal and issuance of a Notice to Proceed, with the exception of reimbursable costs associated with Preconstruction Services, the Construction Manager shall not incur any cost to be reimbursed as part of the Cost of the Work, except as the Owner may specifically authorize in writing.

§ 2.2.8 The Owner shall authorize the Architect to provide the revisions to the Drawings and Specifications to incorporate the agreed-upon assumptions and clarifications contained in the Guaranteed Maximum Price Amendment. The Owner shall promptly furnish those revised Drawings and Specifications to the Construction Manager as they are revised. The Construction Manager shall notify the Owner of any inconsistencies between the

Guaranteed Maximum Price Amendment and the revised Drawings and Specifications, provided the Architect clouds all changes to the Drawings and Specifications on which the Guaranteed Maximum Price was based.

§ 2.2.9 The Construction Manager shall include in the Guaranteed Maximum Price all sales, consumer, use and similar taxes for the Work provided by the Construction Manager that are legally enacted at the time the Guaranteed Maximum Price Amendment is executed.

§ 2.3 Construction Phase

§ 2.3.1 General

§ 2.3.1.1 For purposes of Section 8.1.2 of A201–2007 (as amended), the date of commencement of the Work shall mean the date of commencement of the Construction Phase.

§ 2.3.1.2 The Construction Phase shall commence upon the Owner's acceptance of the Construction Manager's Guaranteed Maximum Price proposal or the Owner's issuance of a Notice to Proceed, whichever occurs earlier.

§ 2.3.2 Administration

§ 2.3.2.1 Those portions of the Work that the Construction Manager does not customarily perform with the Construction Manager's own personnel shall be performed under subcontracts or by other appropriate agreements with the Construction Manager. The Owner may designate specific persons from whom, or entities from which, the Construction Manager shall obtain bids. However, if the Guaranteed Maximum Price has been established, the Owner may not prohibit the Construction Manager from obtaining bids from other bidders. The Construction Manager shall obtain bids from Subcontractors and from suppliers of materials or equipment fabricated especially for the Work and shall deliver such bids to the Owner. The Owner shall then determine, in consultation with the Construction Manager and the Architect, which bids will be accepted. The Construction Manager shall not be required to contract with anyone to whom the Construction Manager has reasonable objection.

§ 2.3.2.2 If the Guaranteed Maximum Price has been established and when a specific bidder (1) is recommended to the Owner by the Construction Manager, (2) is qualified to perform that portion of the Work, and (3) has submitted a bid that conforms to the requirements of the Contract Documents without reservations or exceptions, but the Owner requires that another bid be accepted, then the Construction Manager may require that a Change Order be issued to adjust the Contract Time and the Guaranteed Maximum Price by the difference between the bid of the person or entity recommended to the Owner by the Construction Manager and the amount and time requirement of the subcontract or other agreement actually signed with the person or entity designated by the Owner.

§ 2.3.2.3 Subcontracts or other agreements shall conform to the applicable payment provisions of this Agreement, and shall not be awarded on the basis of cost plus a fee without the prior consent of the Owner. If the subcontract is awarded on a costplus a fee basis, the Construction Manager shall provide in the subcontract for the Owner to receive the same audit rights with regard to the Subcontractor as the Owner receives with regard to the Construction Manager in Section 6.10 below.

§ 2.3.2.4 If the Construction Manager recommends a specific bidder that is a parent, subsidiary, affiliate, or other entity having common ownership or management with the Construction Manager, then the Construction Manager shall promptly notify the Owner in writing of such relationship and notify the Owner of the specific nature of the contemplated transaction.

§ 2.3.2.5 The Construction Manager shall schedule and conduct meetings to discuss such matters as procedures, progress, coordination, scheduling, and status of the Work. The Construction Manager shall prepare and promptly distribute minutes to the Owner and Architect.

§ 2.3.2.6 Upon the execution of the Guaranteed Maximum Price Amendment, the Construction Manager shall prepare and submit to the Owner and Architect a construction schedule for the Work and submittal schedule in accordance with Section 3.10 of A201–2007 (as amended).

§ 2.3.2.7 The Construction Manager shall record the progress of the Project. On a monthly basis, or otherwise as agreed to by the Owner, the Construction Manager shall submit written progress reports to the Owner and Architect, showing percentages of completion and other information required by the Owner. The Construction Manager shall also keep, and make available to the Owner and Architect, a daily log containing a record for each day of weather,

portions of the Work in progress, number of workers on site, identification of equipment on site, problems that might affect progress of the work, accidents, injuries, and other information required by the Owner.

§ 2.3.2.8 The Construction Manager shall develop a system of cost control for the Work, including regular monitoring of actual costs for activities in progress and estimates for uncompleted tasks and proposed changes.

§ 2.4 Professional Services

Section 3.12.10 of A201–2007 (as amended) shall apply to both the Preconstruction and Construction Phases.

§ 2.5 Hazardous Materials

Section 10.3 of A201–2007 (as amended) shall apply to both the Preconstruction and Construction Phases.

ARTICLE 3 OWNER'S RESPONSIBILITIES

§ 3.1 Information and Services Required of the Owner

§ 3.1.1 The Owner shall provide information with reasonable promptness, regarding requirements for and limitations on the Project, including a written program which shall set forth the Owner's objectives, constraints, and criteria, including schedule, space requirements and relationships, flexibility and expandability, special equipment, systems sustainability and site requirements.

§ 3.1.2 Prior to the execution of the Guaranteed Maximum Price Amendment, the Construction Manager may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Construction Manager may only request such evidence if (1) the Owner fails to make payments to the Construction Manager as the Contract Documents require, (2) a change in the Work materially changes the Contract Sum, or (3) the Construction Manager identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Construction Manager and Architect.

§ 3.1.3 The Owner shall establish and periodically update the Owner's budget for the Project, including (1) the budget for the Cost of the Work as defined in Section 6.1.1, (2) the Owner's other costs, and (3) reasonable contingencies related to all of these costs. If the Owner significantly increases or decreases the Owner's budget for the Cost of the Work, the Owner shall notify the Construction Manager and Architect. The Owner and the Architect, in consultation with the Construction Manager, shall thereafter agree to a corresponding change in the Project's scope and quality.

§ 3.1.4 **Structural and Environmental Tests, Surveys and Reports.** During the Preconstruction Phase, the Owner shall furnish the following information or services with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services. The Construction Manager shall be entitled to rely on the accuracy of information and services furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 3.1.4.1 The Owner shall furnish tests, inspections and reports required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 3.1.4.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The surveys and legal information shall include, as applicable, grades and lines of streets, alleys, pavements and adjoining property and structures; designated wetlands; adjacent drainage; rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries and contours of the site; locations, dimensions and necessary data with respect to existing buildings, other improvements and trees; and information concerning available utility services and lines, both public and private, above and below grade, including inverts and depths. All the information on the survey shall be referenced to a Project benchmark.

§ 3.1.4.3 The Owner, when such services are requested, shall furnish services of geotechnical engineers, which may include but are not limited to test borings, test pits, determinations of soil bearing values, percolation tests,

evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

§ 3.1.4.4 During the Construction Phase, the Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Construction Manager's performance of the Work with reasonable promptness after receiving the Construction Manager's written request for such information or services.

§ 3.2 Owner's Designated Representative

The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owners approval or authorization. The Owner's representative shall render decisions promptly and furnish information expeditiously, so as to avoid unreasonable delay in the services or Work of the Construction Manager. Except as otherwise provided in Section 4.2.1 of A201–2007 (as amended), the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 3.2.1 Legal Requirements. The Owner shall furnish all legal, insurance and accounting services, including auditing services, that may be reasonably necessary at any time for the Project to meet the Owner's needs and interests.

§ 3.3 Architect

The Owner shall retain an Architect to provide services, duties and responsibilities as described in AIA Document B103™–2007, Standard Form of Agreement Between Owner and Architect, including any additional services requested by the Construction Manager that are necessary for the Preconstruction and Construction Phase services under this Agreement. The Owner shall provide the Construction Manager a copy of the executed agreement between the Owner and the Architect, and any further modifications to the agreement.

ARTICLE 4 COMPENSATION AND PAYMENTS FOR PRECONSTRUCTION PHASE SERVICES

§ 4.1 Compensation

§ 4.1.1 For the Construction Manager's Preconstruction Phase services, the Owner shall compensate the Construction Manager as follows:

The fee for preconstruction services shall be a lump sum of **Forty Five Thousand** Dollars ($45,000.00). Any miscellaneous costs associated with the delivery of preconstruction services (printing, advertising, travel, etc.) shall be invoiced at direct cost of the item without mark-up or profit for the Construction Manager. If project proceeds to construction under this contract, there will be no charge for preconstruction services.

(Paragraphs deleted)

§ 4.1.3 Compensation based on Direct Personnel Expense includes the direct salaries of the Construction Manager's personnel providing Preconstruction Phase services on the Project and the Construction Manager's costs for the mandatory and customary contributions and benefits related thereto, such as employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, employee retirement plans and similar contributions.

(Paragraph deleted)

§ 4.2 Payments

§ 4.2.1 Unless otherwise agreed, payments for services will be in accordance with 4.1.1.

§ 4.2.2 Payments are due and payable upon presentation of the Construction Manager's invoice. Amounts unpaid thirty (30) days after the invoice date shall bear interest at the rate entered below, or in the absence thereof at the legal rate prevailing from time to time at the principal place of business of the Construction Manager.
(Insert rate of monthly or annual interest agreed upon.)

ARTICLE 5 COMPENSATION FOR CONSTRUCTION PHASE SERVICES

§ 5.1 For the Construction Manager's performance of the Work as described in Section 2.3, the Owner shall pay the Construction Manager the Contract Sum in current funds for the Construction Manager's performance of the

Contract. The Contract Sum is the Cost of the Work as defined in Section 6.1.1 plus the Construction Manager's Fee.

§ 5.1.1 The Construction Manager's Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Construction Manager's Fee.)

A lump sum equal to **4.75%** of the Cost of the Work. The Construction Manager's Fee shall be adjusted for changes in the Work by zero percent (0%) for deductive changes and **4.75%** for additive changes.

§ 5.1.2 Rental rates for Construction Manager-owned equipment shall not exceed One Hundred percent (100%) of the standard rate paid at the place of the Project.

§ 5.1.3 Unit prices, if any:
(Identify and state the unit price; state the quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)
To be determined in GMP Amendment		

(Table deleted)
(Paragraphs deleted)

§ 5.2 Guaranteed Maximum Price

§ 5.2.1 The Construction Manager guarantees that the Contract Sum shall not exceed the Guaranteed Maximum Price set forth in the Guaranteed Maximum Price Amendment, as it is amended from time to time. To the extent the Cost of the Work exceeds the Guaranteed Maximum Price, the Construction Manager shall bear such costs in excess of the Guaranteed Maximum Price without reimbursement or additional compensation from the Owner. One Hundred percent (100%) of nay cost savings below the ultimate agreed upon Guaranteed Maximum Price shall be returned to the owner.
(Insert specific provisions if the Construction Manager is to participate in any savings.)

§ 5.2.1.2 Owner acknowledges that the Guaranteed Maximum Price applies in the aggregate to all categories and line items of the Cost of Work as defined in Article 6 of this Agreement and in no event shall be considered a line item guarantee of the cost of any individual portion of the Work.

§ 5.2.2 The Guaranteed Maximum Price is subject to additions and deductions by Change Order as provided in the Contract Documents and the Date of Substantial Completion shall be subject to adjustment as provided in the Contract Documents.

§ 5.3 Changes in the Work

§ 5.3.1 The Owner may, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions. The Owner shall issue such changes in writing. The Architect may make minor changes in the Work as provided in Section 7.4 of AIA Document A201–2007 (as amended), General Conditions of the Contract for Construction. The Construction Manager shall be entitled to an equitable adjustment in the Contract Time as a result of changes in the Work.

§ 5.3.2 Adjustments to the Guaranteed Maximum Price on account of changes in the Work subsequent to the execution of the Guaranteed Maximum Price Amendment may be determined by any of the methods listed in Section 7.3.3 of AIA Document A201–2007 (as amended), General Conditions of the Contract for Construction.

§ 5.3.3 In calculating adjustments to subcontracts (except those awarded with the Owner's prior consent on the basis of cost plus a fee), the terms "cost" and "fee" as used in Section 7.3.3.3 of AIA Document A201–2007 (as amended) and the term "costs" as used in Section 7.3.7 of AIA Document A201–2007 (as amended) shall have the meanings assigned to them in AIA Document A201–2007 (as amended) and shall not be modified by Sections 5.1 and 5.2, Sections 6.1 through 6.7, and Section 6.8 of this Agreement. Adjustments to subcontracts awarded with the Owner's prior consent on the basis of cost plus a fee shall be calculated in accordance with the terms of those subcontracts.

§ 5.3.4 In calculating adjustments to the Guaranteed Maximum Price, the terms "cost" and "costs" as used in the above-referenced provisions of AIA Document A201–2007 (as amended) shall mean the Cost of the Work as defined in Sections 6.1 to 6.7 of this Agreement and the term "fee" shall mean the Construction Manager's Fee as defined in Section 5.1 of this Agreement.

§ 5.3.5 If no specific provision is made in Section 5.1.2 for adjustment of the Construction Manager's Fee in the case of changes in the Work, or if the extent of such changes is such, in the aggregate, that application of the adjustment provisions of Section 5.1.2 will cause substantial inequity to the Owner or Construction Manager, the Construction Manager's Fee shall be equitably adjusted on the same basis that was used to establish the Fee for the original Work, and the Guaranteed Maximum Price shall be adjusted accordingly.

ARTICLE 6 COST OF THE WORK FOR CONSTRUCTION PHASE

§ 6.1 Costs to Be Reimbursed

§ 6.1.1 The term Cost of the Work shall mean costs necessarily incurred by the Construction Manager in the proper performance of the Work. The Cost of the Work shall include only the items set forth in Sections 6.1 through 6.7.

§ 6.1.1.1 The sum for General Conditions will be billed as a lump sum and paid in monthly installments commencing with the next calendar month following the date of commencement of construction of the Project and concluding on the date of completion of the Work. Payments will be pro-rated for part of a calendar month at the commencement of construction and the calendar month in which Final Completion occurs.

§ 6.1.2 Where any cost is subject to the Owner's prior approval, the Construction Manager shall obtain this approval prior to incurring the cost. The parties shall endeavor to identify any such costs prior to executing Guaranteed Maximum Price Amendment.

§ 6.2 Labor Costs

§ 6.2.1 Wages of construction workers directly employed by the Construction Manager to perform the construction of the Work at the site or at off-site locations or workshops.

§ 6.2.2 Salaries and burden of the Construction Manager's supervisory, project/operations management, executive, safety and administrative personnel, when engaged in execution of the Work, whether at the site, at the Construction Manager's principal office or offices other than the site office. These persons costs will be charged on an hourly basis and will be included in an agreed upon General Conditions costs.

§ 6.2.3 Costs paid or incurred by the Construction Manager for taxes, insurance, contributions, assessments and benefits required by law or collective bargaining agreements, and, for personnel not covered by such agreements, customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, collectively referred to as "Labor Burden", shall be charged at a flat rate of 49% of base wage, provided that such costs are based on wages and salaries included in the Cost of the Work as described herein. Owner acknowledges that the Labor Burden rate set in this 6.2.3 is confidential and competitive to Construction Manager, and shall not be disclosed to any third-party without advance written authorization of Construction Manager's Operations President.

§ 6.2.4 The Contract Sum is based upon the Project not being subject to State and Federal Prevailing Wage Law. In the event that this Project becomes subject to State or Federal Prevailing Wage Law the Contract Sum will be adjusted accordingly.

§ 6.2.5 Bonuses, profit sharing, incentive compensation and any other discretionary payments paid to anyone hired by the Construction Manager or paid to any Subcontractor or vendor, with the Owner's prior approval.

§ 6.3 Subcontract Costs

Payments made by the Construction Manager to Subcontractors in accordance with the requirements of the subcontracts.

§ 6.4 Costs of Materials and Equipment Incorporated in the Completed Construction

§ 6.4.1 Costs, including transportation and storage, of materials and equipment incorporated or to be incorporated in the completed construction.

§ 6.4.2 Costs of materials described in the preceding Section 6.4.1 in excess of those actually installed to allow for reasonable waste and spoilage. Unused excess materials, if any, shall become the Owner's property at the completion of the Work or, at the Owner's option, shall be sold by the Construction Manager. Any amounts realized from such sales shall be credited to the Owner as a deduction from the Cost of the Work.

§ 6.5 Costs of Other Materials and Equipment, Temporary Facilities and Related Items

§ 6.5.1 Costs of transportation, storage, installation, maintenance, dismantling and removal of materials, supplies, temporary facilities, machinery, equipment and hand tools not customarily owned by construction workers that are provided by the Construction Manager at the site and fully consumed in the performance of the Work. Costs of materials, supplies, temporary facilities, machinery, equipment and tools that are not fully consumed shall be based on the cost or value of the item at the time it is first used on the Project site less the value of the item when it is no longer used at the Project site. Costs for items not fully consumed by the Construction Manager shall mean fair market value.

§ 6.5.2 Rental charges for temporary facilities, machinery, equipment and hand tools not owned by the construction workers, which are provided by the Construction Manager at the site, whether rented from the Construction Manager or others, and costs of transportation, installation, minor repairs and replacements, dismantling and removal thereof. Equipment owned by the Construction manager shall be rented at a rate not to exceed the standard rental rate in the geographical area in which the project is located.

§ 6.5.3 Costs of removal of debris and/or costs associated with diverting waste to a waste recycling center from the site of the Work and its proper and legal disposal.

§ 6.5.4 Costs of document reproductions, facsimile transmissions and long-distance telephone calls, data lines, postage and parcel delivery charges, telephone service at the site and reasonable petty cash expenses of the site office.

§ 6.5.5 That portion of the reasonable expenses of the Construction Manager's supervisory or administrative personnel incurred while traveling in discharge of duties connected with the Work.

§ 6.5.6 Costs of materials and equipment suitably stored off the site at a mutually acceptable location, subject to the Owner's prior approval.

§ 6.6 Miscellaneous Costs

§ 6.6.1 Premiums for that portion of insurance, bonds and other surety programs required by the Contract Documents and the Construction Manager that can be directly attributed to this Contract. Self-insurance for either full or partial amounts of the coverages required by the Contract Documents, with the Owner's prior approval.

§ 6.6.2 Sales, use or similar taxes imposed by a governmental authority that are related to the Work and for which the Construction Manager is liable.

§ 6.6.3 Fees and assessments for the building permit and for other permits, licenses and inspections for which the Construction Manager is required by the Contract Documents to pay.

§ 6.6.4 Fees of laboratories for tests required by the Contract Documents, except those related to defective or nonconforming Work for which reimbursement is excluded by Section 13.5.3 of AIA Document A201–2007 (as amended) or by other provisions of the Contract Documents, and which do not fall within the scope of Section 6.7.3.

§ 6.6.5 Royalties and license fees paid for the use of a particular design, process or product required by the Contract Documents; the cost of defending suits or claims for infringement of patent rights arising from such requirement of the Contract Documents; and payments made in accordance with legal judgments against the Construction Manager resulting from such suits or claims and payments of settlements made with the Owner's consent. However, such costs of legal defenses, judgments and settlements shall not be included in the calculation of the Construction Manager's Fee or subject to the Guaranteed Maximum Price. If such royalties, fees and costs are excluded by the last sentence of Section 3.17 of AIA Document A201–2007 (as amended) or other provisions of the Contract Documents, then they shall not be included in the Cost of the Work.

§ 6.6.6 Costs for electronic equipment and software, directly related to the Work.

§ 6.6.7 Deposits lost for causes other than the Construction Manager's negligence or failure to fulfill a specific responsibility in the Contract Documents.

§ 6.6.8 Legal, mediation and arbitration costs, including attorneys' fees, other than those arising from disputes between the Owner and Construction Manager, reasonably incurred by the Construction Manager after the execution of this Agreement in the performance of the Work and with the Owner's prior approval, which shall not be unreasonably withheld.

§ 6.6.9 Expenses incurred in accordance with the Construction Manager's standard written personnel policy for relocation and temporary living allowances of the Construction Manager's personnel required for the Work.

§ 6.7 Other Costs and Emergencies

§ 6.7.1 Other costs incurred in the performance of the Work if, and to the extent, approved in advance in writing by the Owner.

§ 6.7.2 Costs incurred in taking action to prevent threatened damage, injury or loss in case of an emergency affecting the safety of persons and property, as provided in Section 10.4 of AIA Document A201–2007 (as amended).

§ 6.7.3 Costs of repairing or correcting damaged or nonconforming Work executed by the Construction Manager, Subcontractors or suppliers, provided that such damaged or nonconforming Work was not caused by negligence or failure to fulfill a specific responsibility of the Construction Manager and only to the extent that the cost of repair or correction is not recovered by the Construction Manager from insurance, sureties, Subcontractors, suppliers, or others.

§ 6.7.4 The costs described in Sections 6.1 through 6.7 shall be included in the Cost of the Work, notwithstanding any provision of AIA Document A201–2007 (as amended) or other Conditions of the Contract which may require the Construction Manager to pay such costs, unless such costs are excluded by the provisions of Section 6.8.

§ 6.8 Costs Not To Be Reimbursed

§ 6.8.1 The Cost of the Work shall not include the items listed below:

.1 Salaries and other compensation of the Construction Manager's personnel stationed at the Construction Manager's principal office or offices other than the site office, except as specifically provided in Section 6.2, or as may be provided in Article 11;

.2 Expenses of the Construction Manager's principal office and offices other than the site office;

.3 Overhead and general expenses, except as may be expressly included in Sections 6.1 to 6.7;

.4 The Construction Manager's capital expenses, including interest on the Construction Manager's capital employed for the Work;

.5 Except as provided in Section 6.7.3 of this Agreement, costs due to the negligence or failure of the Construction Manager, Subcontractors and suppliers or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable to fulfill a specific responsibility of the Contract;

.6 Any cost not specifically and expressly described in Sections 6.1 to 6.7; and

.7 Costs, other than costs included in Change Orders approved by the Owner, that would cause the Guaranteed Maximum Price to be exceeded.

§ 6.9 Discounts, Rebates and Refunds

§ 6.9.1 Cash discounts obtained on payments made by the Construction Manager shall accrue to the Owner if (1) before making the payment, the Construction Manager included them in an Application for Payment and received payment from the Owner, or (2) the Owner has deposited funds with the Construction Manager with which to make payments; otherwise, cash discounts shall accrue to the Construction Manager. Trade discounts, rebates, refunds and amounts received from sales of surplus materials and equipment shall accrue to the Owner, and the Construction Manager shall make provisions so that they can be obtained.

§ 6.9.2 Amounts that accrue to the Owner in accordance with the provisions of Section 6.9.1 shall be credited to the Owner as a deduction from the Cost of the Work.

§ 6.10 Accounting Records

The Construction Manager shall keep full and detailed records and accounts related to the cost of the Work and exercise such controls as may be necessary for proper financial management under this Contract and to substantiate all costs incurred. The Owner and the Owner's auditors shall, during regular business hours and upon reasonable notice, be afforded access to, and shall be permitted to audit and copy, the Construction Manager's records and accounts, including complete documentation supporting accounting entries, books, correspondence, instructions, drawings, receipts, subcontracts, Subcontractor's proposals, purchase orders, vouchers, memoranda and other data relating to this Contract. The Construction Manager shall preserve these records for a period of three years after final payment, or for such longer period as may be required by law.

(Paragraphs deleted)

§ 6.11 The Contractor shall not be obligated to provide any services, information or documentation relating to its Work to auditors working on a contingency fee basis (auditor's fees calculated as a percentage of the client's net recovery), nor shall any reimbursement obligation otherwise required by the Contract Documents be applicable to Contractor when an auditor is hired by Owner on a contingency fee basis.

ARTICLE 7 PAYMENTS FOR CONSTRUCTION PHASE SERVICES

§ 7.1 Progress Payments

§ 7.1.1 Based upon Applications for Payment submitted to the Architect by the Construction Manager and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Construction Manager as provided below and elsewhere in the Contract Documents.

§ 7.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

§ 7.1.3 Provided an Application for Payment is received by the architect not later than the 1st day of the month, the Owner shall make payment to the Construction Manager not later than the 20th day of the **same** month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than 30 days after the Architect received the Application for Payment. Owner and Construction Manager agree to the terms outlined in 4.2.2 shall apply to this article 7.1.3. An Application for Payment shall be deemed certified 14 days after submittal unless the Owner or Architect objects to all or part of the Application for Payment within 14 days of submittal.

§ 7.1.4 If required by the Owner, with each Application for Payment, the Construction Manager shall submit a detailed cost transaction report generated from the Construction Manager's accounting system, and upon request by the Owner or Architect, shall provide any other evidence reasonably required by the Owner or Architect to demonstrate that cash disbursements already made by the Construction Manager on account of the Cost of the Work equal or exceed (1) progress payments already received by the Construction Manager, less (2) that portion of those payments attributable to the Construction Manager's Fee, plus (3) payrolls for the period covered by the present Application for Payment.

§ 7.1.5 Each Application for Payment shall be based on the most recent schedule of values submitted by the Construction Manager in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among the various portions of the Work, except that the Construction Manager's Fee shall be shown as a single separate item. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Construction Manager's Applications for Payment.

§ 7.1.6 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed, or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Construction Manager on account of that portion of the Work for which the Construction Manager has made or intends to make actual payment prior to the next

Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 7.1.7 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

.1 Take that portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values. Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201–2007 (as amended);

.2 Add that portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work, or if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

.3 Add the Construction Manager's Fee, less retainage of five percent (5%). The Construction Manager's Fee shall be computed upon the Cost of the Work at the rate stated in Section 5.1.1 or, if the Construction Manager's Fee is stated as a fixed sum in that Section, shall be an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;

.4 Subtract retainage of five precent (5%) from that portion of the Work that the Construction Manager self-performs;

.5 Subtract the aggregate of previous payments made by the Owner;

.6 Subtract the shortfall, if any, indicated by the Construction Manager in the documentation required by Section 7.1.4 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner's auditors in such documentation; and

.7 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007 (as amended).

§ 7.1.8 Except with the Owner's prior approval, payments to Subcontractors shall be subject to retention of not less than ten percent (10%). Upon recommendation of the Construction Manager, a Subcontractor's retainage may be reduced by a percentage established and agreed upon by the Construction Manager. The full ten percent (10%) retainage may be reinstated with respect to remaining payments for identified Subcontractors whose manner of completion of the work and its progress do not remain satisfactory to the Construction Manager and/or the Owner, or if any surety withholds its consent, or for other good and sufficient reasons.

§ 7.1.9 If the manner of completion of the work, and its progress are and remain satisfactory for the Owner, and the Work is shown at fifty percent (50%) or more complete in the Application for Payment, without reduction of previous retainage, no further retainage will be withheld.

§ 7.1.10 In taking action on the Construction Manager's Applications for Payment, the Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Construction Manager and shall not be deemed to represent that the Architect has made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Section 7.1.4 or other supporting data; that the Architect has made exhaustive or continuous on-site inspections; or that the Architect has made examinations to ascertain how or for what purposes the Construction Manager has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner's auditors acting in the sole interest of the Owner.

§ 7.1.11 Except with the Owner's prior approval, the Construction Manager shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 7.1.12 The receipt by Construction Manager of a partial payment of any amount due to Construction Manager endorsed as payment in full will be deemed to be a part payment only, and any endorsements or statements on a check or other form of commercial paper, or any other document accompanying the payment, shall not be deemed an accord and/or satisfaction, notwithstanding such endorsements.

§ 7.2 Final Payment

§ 7.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Construction Manager when

.1 the Construction Manager has fully performed the Contract except for the Construction Manager's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007 (as amended).

.2 the Construction Manager has submitted a final accounting for the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment has been issued by the Architect.

The Owner's final payment to the Construction Manager shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

§ 7.2.2 The Owner's auditors will review and report in writing on the Construction Manager's final accounting within 30 days after delivery of the final accounting to the Architect by the Construction Manager. Based upon such Cost of the Work as the Owner's auditors report to be substantiated by the Construction Manager's final accounting, and provided the other conditions of Section 7.2.1 have been met, the Architect will, within seven days after receipt of the written report of the Owner's auditors, either issue to the Owner a final Certificate for Payment with a copy to the Construction Manager, or notify the Construction Manager and Owner in writing of the Architect's reasons for withholding a certificate as provided in Section 9.5.1 of the AIA Document A201–2007 (as amended). The time periods stated in this Section supersede those stated in Section 9.4.1 of the AIA Document A201–2007 (as amended). The Architect is not responsible for verifying the accuracy of the Construction Manager's final accounting.

§ 7.2.3 If the Owner's auditors report the Cost of the Work as substantiated by the Construction Manager's final accounting to be less than claimed by the Construction Manager, the Construction Manager shall be entitled to request mediation of the disputed amount without seeking an initial decision pursuant to Section 15.2 of A201–2007 (as amended). A request for mediation shall be made by the Construction Manager within 30 days after the Construction Manager's receipt of a copy of the Architect's final Certificate for Payment. Failure to request mediation within this 30-day period shall result in the substantiated amount reported by the Owner's auditors becoming binding on the Construction Manager. Pending a final resolution of the disputed amount, the Owner shall pay the Construction Manager the amount certified in the Architect's final Certificate for Payment.

§ 7.2.4 If, subsequent to final payment and at the Owner's request, the Construction Manager incurs costs described in Section 6.1.1 and not excluded by Section 6.8 to correct defective or nonconforming Work, the Owner shall reimburse the Construction Manager such costs and the Construction Manager's Fee applicable thereto on the same basis as if such costs had been incurred prior to final payment, but not in excess of the Guaranteed Maximum Price. If the Construction Manager has participated in savings as provided in Section 5.2.1, the amount of such savings shall be recalculated and appropriate credit given to the Owner in determining the net amount to be paid by the Owner to the Construction Manager.

ARTICLE 8 INSURANCE AND BONDS

§ 8.1 For all phases of the Project, the Construction Manager and the Owner shall purchase and maintain insurance, and the Construction Manager shall provide bonds as set forth in Article 11 of AIA Document A201–2007 (as amended).

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007 (as amended).)

§ 8.1.1 Workers' Compensation and Employers' Liability meeting statutory limits mandated by state and federal laws. If (1) limits in excess of those required by statute are to be provided, or (2) the employer is not statutorily bound to obtain such insurance coverage or (3) additional coverages are required, additional coverages and limits for such insurance shall be as follows:

§ 8.1.2 Commercial General Liability including coverage for Premises-Operations, Independent Contractors' Protective, Products-Completed Operations, Contractual Liability, Personal Injury and Broad Form Property Damage (including coverage for Explosion, Collapse and Underground hazards):

$ 2,000,000	Each Occurrence
$ 4,000,000	General Aggregate
$ 2,000,000	Personal and Advertising Injury
$ 4,000,000	Products-Completed Operations Aggregate

.1 The policy shall be endorsed to have the General Aggregate apply to this Project only.

.2 Products and Completed Operations insurance shall be maintained for a minimum period of at least (1) year(s) after either 90 days following Substantial Completion or final payment, whichever is earlier.

.3 The Contractual Liability insurance shall include coverage sufficient to meet the obligations in Section 3.18 of A201™–2007 (as amended).

§ 8.1.3 Automobile Liability (owned, non-owned and hired vehicles) for bodily injury and property damage:
$1,000,000 Each Accident

§ 8.1.4 Other coverage:

$ 25,000,000 – Umbrella Coverage

That portion of insurance including deductibles and bond premiums that can be directly attributed to this Contract and expenses for Subcontractor Surety shall be reimbursed at the following rate: 1) Construction Manager's Subcontractor Default Insurance (SDI) at one-point-two-five percent (1.25%) of the subcontract value; or 2) Construction Manager's actual premium cost of the above. Application of SDI or surety bond shall be at the sole discretion of the Construction Manager.

The cost of the Construction Manager's insurance program shall be reimbursed at the rate of $8.50 per thousand dollars of Contract Sum. Rates shall be subject to adjustment on the first day of each calendar year if required by the Construction Manager.

The Construction Manager will maintain Builders Risk Insurance at the rate of $0.15 per thousand of Contract Sum per month to insure the components of the Project while under construction and shall also maintain General Liability coverage as identified above to insure against losses to the adjacent structures from damage which may be caused by construction activity.
Owner acknowledges that the information provided in this 8.1.4 is trade secret, proprietary, or otherwise confidential and competitive to Construction Manager, and shall not be disclosed to any third-party without advance written authorization of Construction Manager's Operations President.
(If Umbrella Excess Liability coverage is required over the primary insurance or retention, insert the coverage limits. Commercial General Liability and Automobile Liability limits may be attained by individual policies or by a combination of primary policies and Umbrella and/or Excess Liability policies. If Project Management Protective Liability Insurance is to be provided, state the limits here.)

(Table deleted)
§ 8.1.5 If required, the Construction Manager shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Construction Manager's usual source, and the cost thereof shall be included in the Cost of the Work. The amount of each bond shall be equal to one hundred percent (100%) of the Contract Sum.

ARTICLE 9 DISPUTE RESOLUTION

§ 9.1 Any Claim between the Owner and Construction Manager shall be resolved in accordance with the provisions set forth in this Article 9 and Article 15 of A201–2007 (as amended). However, for Claims arising from or relating to the Construction Manager's Preconstruction Phase services, no decision by the Initial Decision Maker shall be required as a condition precedent to mediation or binding dispute resolution.

§ 9.2 For any Claim subject to, but not resolved by mediation pursuant to Section 15.3 of AIA Document A201–2007 (as amended), the method of binding dispute resolution shall be as follows:
(Check the appropriate box. If the Owner and Construction Manager do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

[X] Arbitration pursuant to Section 15.4 of AIA Document A201–2007 (as amended)

[ ] Litigation in a court of competent jurisdiction

[ ] Other: *(Specify)*

(Paragraphs deleted)

ARTICLE 10 TERMINATION OR SUSPENSION

§ 10.1 Termination Prior to Establishment of the Guaranteed Maximum Price

§ 10.1.1 Prior to the execution of the Guaranteed Maximum Price Amendment, the Owner may terminate this Agreement upon not less than seven days' written notice to the Construction Manager for the Owner's convenience and without cause, and the Construction Manager may terminate this Agreement, upon not less than seven days' written notice to the Owner, for the reasons set forth in Section 14.1.1 of A201–2007 (as amended).

§ 10.1.2 In the event of termination of this Agreement pursuant to Section 10.1.1, the Construction Manager shall be equitably compensated for Preconstruction Phase services performed prior to receipt of a notice of termination. In no event shall the Construction Manager's compensation under this Section exceed the compensation set forth in Section 4.1.

§ 10.1.3 If the Owner terminates the Contract pursuant to Section 10.1.1 after the commencement of the Construction Phase but prior to the execution of the Guaranteed Maximum Price Amendment, the Owner shall pay to the Construction Manager an amount calculated as follows, which amount shall be in addition to any compensation paid to the Construction Manager under Section 10.1.2:

.1 Take the Cost of the Work incurred by the Construction Manager to the date of termination;

.2 Add the Construction Manager's Fee computed upon the Cost of the Work to the date of termination at the rate stated in Section 5.1 or, if the Construction Manager's Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion; and

.3 Subtract the aggregate of previous payments made by the Owner for Construction Phase services.

The Owner shall also pay the Construction Manager fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Construction Manager which the Owner elects to retain and which is not otherwise included in the Cost of the Work. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Construction Manager shall, as a condition of receiving the payments referred to in this Article 10, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Construction Manager, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Construction Manager under such subcontracts or purchase orders. All subcontracts, purchase orders and rental agreements entered into by the Construction Manager will contain provisions allowing for assignment to the Owner as described above.

If the Owner accepts assignment of subcontracts, purchase orders or rental agreements as described above, the Owner will reimburse or indemnify the Construction Manager for all costs arising under the subcontract, purchase order or rental agreement, if those costs would have been reimbursable as Cost of the Work if the contract had not been terminated. If the Owner chooses not to accept assignment of any subcontract, purchase order or rental agreement that would have constituted a Cost of the Work had this agreement not been terminated, the Construction Manager will terminate the subcontract, purchase order or rental agreement and the Owner will pay the Construction Manager the costs necessarily incurred by the Construction Manager because of such termination.

§ 10.2 Termination Subsequent to Establishing Guaranteed Maximum Price
Following execution of the Guaranteed Maximum Price Amendment and subject to the provisions of Section 10.2.1 and 10.2.2 below, the Contract may be terminated as provided in Article 14 of AIA Document A201–2007 (as amended).

§ 10.2.1 If the Owner terminates the Contract after execution of the Guaranteed Price Amendment, the amount payable to the Construction Manager pursuant to Sections 14.2 and 14.4 of A201–2007 (as amended) shall not exceed the amount the Construction Manager would otherwise have received pursuant to Sections 10.1.2 and 10.1.3 of this Agreement.

§ 10.2.2 If the Construction Manager terminates the Contract after execution of the Guaranteed Maximum Price Amendment, the amount payable to the Construction Manager under Section 14.1.3 of A201–2007 (as amended) shall not exceed the amount the Construction Manager would otherwise have received under Sections 10.1.2 and 10.1.3 above, except that the Construction Manager's Fee shall be calculated as if the Work had been fully completed by the Construction Manager, utilizing as necessary a reasonable estimate of the Cost of the Work for Work not actually completed.

§ 10.3 Suspension
The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007 (as amended). In such case, the Guaranteed Maximum Price and Contract Time shall be increased as provided in Section 14.3.2 of AIA Document A201–2007 (as amended), except that the term "profit" shall be understood to mean the Construction Manager's Fee as described in Sections 5.1 and 5.3.5 of this Agreement.

ARTICLE 11 MISCELLANEOUS PROVISIONS
§ 11.1 Terms in this Agreement shall have the same meaning as those in A201–2007 (as amended).

§ 11.2 Ownership and Use of Documents
Section 1.5 of A201–2007 (as amended) shall apply to both the Preconstruction and Construction Phases.

§ 11.3 Governing Law
Section 13.1 of A201–2007 (as amended) shall apply to both the Preconstruction and Construction Phases.

§ 11.4 Assignment
The Owner and Construction Manager, respectively, bind themselves, their agents, successors, assigns and legal representatives to this Agreement. Neither the Owner nor the Construction Manager shall assign this Agreement without the written consent of the other, except that the Owner may assign this Agreement to a lender providing financing for the Project if the lender agrees to assume the Owner's rights and obligations under this Agreement. Except as provided in Section 13.2.2 of A201–2007 (as amended), neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 11.5 Other provisions:

§ 11.5.1 Owner acknowledges that certain information provided to it by Construction Manager contains information deemed trade secret, proprietary, competitive or otherwise confidential to Construction Manager, regardless of whether specifically identified as such in this Agreement. Such information includes but is not limited to Construction Manager's research, development, methods, processes, techniques, operations, computer programs, pricing/price modeling, and financial data of Construction Manager, it's subsidiaries, operating service groups and affiliated companies, including data provided in support of Applications for Payment, Change Orders, or commercial information, including value engineering and constructability studies; current and prospective clients, subcontractors, and/or competitors; and proposals. Owner acknowledges the value of such information to the Construction Manager, and agrees to use reasonable diligence in protecting this information from unauthorized disclosures to third parties (excluding any governmental regulatory bodies entitled to access such information by law, or Owner's parent, subsidiary of affiliated companies, or Owner's auditors or lenders to the extent such disclosure is necessary).

§ 11.5.2 If Drawings are revised after the Drawings referenced in the Contract, the Owner shall have the Architect re-date all revised sheets and clearly identify all changes by bubble and delta number or other means acceptable to the Construction Manager and Owner. The Owner and Construction Manager acknowledge that it is difficult to determine and implement changes that are not so identified. Regardless if the Contract is amended to incorporate revised Drawings, the Guaranteed Maximum Price and Contract Time are subject to additional equitable adjustments for the cost and time impacts if implementing any changes not so identified.

ARTICLE 12 SCOPE OF THE AGREEMENT

§ 12.1 This Agreement represents the entire and integrated agreement between the Owner and the Construction Manager and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both Owner and Construction Manager.

§ 12.2 The following documents comprise the Agreement:

.1 AIA Document A133–2009, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price

.2 AIA Document A201–2007 (as amended), General Conditions of the Contract for Construction

.3 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed, or the following:

.4 AIA Document E202™–2008, Building Information Modeling Protocol Exhibit, if completed, or the following:

.5 Other documents:
(List other documents, if any, forming part of the Agreement.)

This Agreement is entered into as of the day and year first written above.

OWNER *(Signature)*	**CONSTRUCTION MANAGER** *(Signature)*
Gaylon Taylor, Superintendent	Andrew Adong, Manager
(Printed name and title)	*(Printed name and title)*

SECTION 00 72 00

GENERAL CONDITIONS

PART 1 - GENERAL

1.01 FORM OF GENERAL CONDITIONS

A. AIA A201 - General Conditions of the Contract for Construction; 2007, as amended.

B. Supplementary Conditions To AIA Document A201-2007.

C. For Contractor's convenience copies follow after the end of this Section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
Buffalo Island Central K-12 Buildings

THE OWNER:
(Name and address)
Buffalo Island Central School District
801 W. Drew St.
Monette, AR 72447

THE ARCHITECT:
(Name and address)
Little & Associates Architects in Partnership with
Cromwell Architects Engineers, Inc.
505 Union Street 2nd Floor
Jonesboro, AR 72401

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TABLE OF ARTICLES

Init.
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INDEX
(Numbers and Topics in Bold are Section Headings)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically excluded in the Agreement, the Contract Documents include other documents such as the advertisement or invitation to bid, Instructions to Bidders,Contractors Bid Manual, schedules, sample forms, other information furnished by the Owner or Construction Manager in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties. Likewise, the Contractor shall be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of Contractor's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. Performance by the Contractor shall be required only to the extent

consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

§ 1.7 ORDER OF PRECEDENCE

§ 1.7.1 In case of conflicts between the drawings and specifications, the specifications shall govern. In any case of the omissions or errors in figures, drawings or specifications, the Contractor shall immediately submit the matter to the Architect for clarification. The Architect's clarifications are final and binding on all parties, subject to an equitable adjustment in Contact Time or Price pursuant to Articles 7 and 8 or claims and disputes in accordance with Article 15.

§ 1.7.2 Where figures are given, they shall be preferred to scaled dimensions.

§ 1.7.3 Any terms that have well-known technical or trade meanings, unless otherwise specifically defined in the Contract Documents, shall be interpreted in accordance with the well-known meanings.

§ 1.7.4 In case of any inconsistency, conflict or ambiguity among the Contract Documents, the documents shall govern in the following order:

a. Change order and written Modifications to this Agreement
b. this Agreement
c. drawings (large scale governing over small scale)
d. approved submittals

e. information furnished by the Owner
f. other documents listed in the Agreement (Among categories of documents having the same order of precedence, the term or provision that includes the most recent date shall control).

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 The Owner shall, at the written request of the Contractor, prior to commencement of the Work or at anytime thereafter, furnish to the Contractor evidence, in a form satisfactory to the Contractor, that adequate financial arrangements have been made to fulfill the Owner's obligations under the Contract. Furnishing of such evidence shall be a condition precedent to commencement or continuation of the Work. After such evidence has been furnished, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor up to 10 complete copies of the Contract Documents for purposes of bidding pursuant to Section 1.5.2

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect

or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor, whether referred to as Construction Manager, General Contractor or Contractor within this and related Contract Documents, is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means,

methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order, or other written approval.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality or type required or permitted by the Contract Documents. Work, materials or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are applicable and legally enacted when bids are received or negotiations concluded.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Document or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and

generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed, if possible, and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor knowingly encounters and recognizes human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence or good faith belief of such existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness to avoid delay in the Work.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

§ 3.9.2 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

(Paragraph deleted)

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the

Work and Project, shall be related to the entire Project to the extent required by the Contract Documents and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare and keep current a schedule of submittals that is coordinated with the Contractor's construction schedule and which allows the Architect reasonable time to review submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.3.3. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by its operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular

manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the

Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

(Paragraphs deleted)

§ 4.3 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

(Paragraph deleted)

§ 4.3.1 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.3.2 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.3.3 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate contractors while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.3.4 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.3.5 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of Final Completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.3.6 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.3.7 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness however delivery of such interpretation shall not be extended to cause the Contractor delay in theWork.

§ 4.3.8 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.3.9 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.3.10 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness; however, delivery of such interpretation shall not be extended to cause the Contractor delay in the Work. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating whether the Owner or the Architect has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If, in the opinion of the Contractor, the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to

which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner, upon approval of Subcontractor, may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly

report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results.

§ 6.2.3 The Contractor shall reimburse the Owner for reasonable costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for reasonable costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner, after notifying responsible party(s) by written notice and allowing the responsible party(s) to resolve this issue, may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect or Construction Manager and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;

.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect in conjunction with the Construction Manager shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment and hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work;

.5 Additional costs of supervision and field office personnel directly attributable to the change; and

.6 General Condition items directly attributed to change order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and consistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time and Contract Sum shall be adjusted by Change Order.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by

such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location provided that stored materials are properly insured. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to

such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a separate contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

(Paragraph deleted)

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall promptly pay each Subcontractor no later than ten days after receipt of payment from the Owner, the amount to which said Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of said Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.4 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2 and 9.6.3.

§ 9.6.5 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.6 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

(Paragraph deleted)

§ 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended

appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.7 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect

will promptly issue a final Certificate for Payment stating that, to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising the Contractors safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, stored at the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and termination of any coverage required to be maintained after final payment.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that

coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage, shall be submitted with the final Application for Payment as required by Section 9.10.2 Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with Contractor's information and belief.

§ 11.1.4 ADDITIONAL INSURED

The Owner **shall** / shall not (indicate one) require Contractor to name Owner as an additional insured on Contractor's General Liability Insurance as provided herein.

§ 11.1.4.1 If required under this Section 11.1.4, Contractor shall provide Owner with an Additional Insured Endorsement. Owner shall be named as an additional insured on Contractor's General Liability Insurance specified for operation and completed operations, but only with respect to liability for bodily injury, property damage or personal and advertising injury to the extent caused by the negligent acts or omissions of Contractor, or those acting on the Contractor's behalf, in the performance of Contractor's Work for Owner at the site.

Any documented additional cost in the form of a surcharge associated with procuring the additional liability coverage in accordance with this paragraph shall be paid by the Owner directly or the costs may be reimbursed by Owner to Contractor by increasing the Contract Price to correspond to the actual cost required to purchase and maintain the additional insured endorsement coverage. Prior to commencement of the Work, Contractor shall obtain and furnish to the Owner a certificate evidencing that the additional insured endorsement has been procured.

§ 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

(Paragraph deleted)

§ 11.3.1.2 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

(Paragraph deleted)

§**11.3.1.3** In the event the Owner elects to provide Builders Risk insurance, the terms of the policy shall be acceptable to the Contractor and in the event of a claim, any costs associated with deductibles shall be the responsibility of the Owner.

§ 11.3.1.4 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or

maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.5 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.6 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.7 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise,

did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. In the event Work is uncovered and determined as conforming to the Contract Documents the costs of recovering and replacement, including compensation for Contractor's service and expenses, shall be at the Owner's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

(Paragraphs deleted)

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense. If such procedures reveal the Work complies with the Contract Documents, all such costs shall be at the Owner's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method indicated in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, and for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

.1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

.2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not

expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent:

.1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall:

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, materials procured, fabricated, partially fabricated or otherwise purchased for the project whether delivered or not yet delivered to the site and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, modification or interpretation of Contract terms, additional cost, additional time, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Architect. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 DIRECT DISCUSSIONS

(Paragraphs deleted)

§ 15.2 .1 If the Parties cannot reach resolution on a matter relating to or arising out of the Agreement, the Parties shall endeavor to reach resolution through good faith direct discussions between the Parties' representatives, who shall possess the necessary authority to resolve such matter and who shall record the date of the first discussions. If the Parties' representatives are not able to resolve such matter within five (5) business Days of the date of first discussion, the Parties' representative shall immediately inform senior executives of the Parties in writing that resolution was not achieved. Upon receipt of such notice, senior executives of the Parties shall meet within five (5) business Days to endeavor to reach resolution. If the dispute remains unresolved after fifteen (15) Days from the date of first discussion, the Parties shall submit such matter to the dispute mitigation and dispute resolution procedures selected herein.

§ 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association, unless otherwise agreed by the parties, in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or arbitrator. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

Accepted:

Owner	Date
Attest	

Contractor	6/13/16 Date
Attest	

Init.

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SECTION 00 73 43

PREVAILING WAGE RATES REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Local school districts are exempt from the Arkansas Prevailing Wage Rates requirements.

PART 2 - PRODUCTS - NOT USED

END OF SECTION

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SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: New Junior and Senior High School for Buffalo Island Central School District, Monette, Arkansas.

B. Owner's Name: Buffalo Island Central School District.

C. Owner's Construction Manager at Risk:
   1. Adam Seiter, Project Manager; Nabholz Construction Services, 1608 West Washington, Jonesboro, AR 72401; 870-934-4800; adam.seiter@nabholz.com.

D. Architect Engineer's Name: Cromwell Architects Engineers, Inc..

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on the Cost of the Work plus a fee as described in Document 00 52 00 - Agreement Form.

1.03 WORK BY OWNER

A. Owner will supply and install the following:

B. Owner will supply the following for installation by Contractor:

1.04 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Provide access to and from site as required by law and by Owner:
   1. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Time Restrictions:
   1. No large trucks or deliveries to site between 7:00 - 8:30 a.m. and between 2:00 - 4:00 p.m.

D. Utility Outages and Shutdown:
   1. Prevent accidental disruption of utility services to other facilities.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Section 00 50 00 - Contracting Forms and Supplements: Forms to be used.

B. Document 00 72 00 - General Conditions and Document 00 73 00 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

C. Section 01 21 00 - Allowances: Payment procedures relating to allowances.

D. Section 01 22 00 - Unit Prices: Monetary values of unit prices, payment and modification procedures relating to unit prices.

1.03 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect Engineer for approval.

B. Forms filled out by hand will not be accepted.

C. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

D. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization and bonds and insurance.

E. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.

G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect Engineer for approval.

C. Forms filled out by hand will not be accepted.

D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

E. Execute certification by signature of authorized officer.

F. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.

G. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

H. Submit three copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01 30 00.
   2. Construction progress schedule, revised and current as specified in Section 01 30 00.
   3. Current construction photographs specified in Section 01 30 00.
   4. Partial release of liens from major Subcontractors and vendors.
   5. Affidavits attesting to off-site stored products.

J. When Architect Engineer requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.05 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to the Contract Documents.

B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect Engineer will issue instructions directly to Contractor.

C. For changes for which advance pricing is desired, Architect Engineer will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within number of days stipulated in the Proposal Request.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect Engineer for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect Engineer.
   3. For pre-determined unit prices and quantities, the amount will based on the fixed unit prices.

E. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract, similarly documented.

F. Execution of Change Orders: Architect Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

G. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00.

END OF SECTION

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SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect Engineer.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

D. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

E. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect Engineer prior to starting work.

F. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes, calculate and certify quantities for payment purposes.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect Engineer, multiplied by the unit price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.
   5. Products remaining on hand after completion of the Work.
   6. Loading, hauling, and disposing of rejected Products.

1.06 DEFECT ASSESSMENT

A. Replace Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of Architect Engineer, it is not practical to remove and replace the Work, Architect Engineer will direct one of the following remedies:
   1. The defective Work may remain, but the unit price will be adjusted to a new unit price at the discretion of Architect Engineer.
   2. The defective Work will be partially repaired to the instructions of the Architect Engineer, and the unit price will be adjusted to a new unit price at the discretion of Architect Engineer.

C. The individual specification sections may modify these options or may identify a specific formula or percentage price reduction.

D. The authority of Architect Engineer to assess the defect and identify payment adjustment is final.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Site mobilization meeting.

D. Progress meetings.

E. Construction progress schedule.

F. Progress photographs.

G. Submittals for review, information, and project closeout.

H. Number of copies of submittals.

I. Submittal procedures.

J. Administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.02 RELATED REQUIREMENTS

A. Section 01 32 16 - Construction Progress Schedule: Form, content, and administration of schedules.

B. Section 01 60 00 - Product Requirements: Product Options and Substitution Requirements.

C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 78 00 - Closeout Submittals - Closeout Submittals Project record documents, operation and maintenance data, warranties and bonds.

E. Other Sections for specific requirements for submittals in those Sections.

1.03 REFERENCE STANDARDS

A. AIA G810 - Transmittal Letter; 2001, or approved equivalent.

1.04 PROJECT COORDINATION

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, for site and building access, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect Engineer through the Project Coordinator:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.

9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Architect Engineer will schedule a meeting after Notice To Proceed.

B. Attendance Required:
1. Owner's Representative.
2. Architect Engineer.
3. Contractor.

C. Agenda: Including, but not necessarily limited to following.
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract and Architect Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.
8. Scheduling activities of a Geotechnical Engineer.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

3.02 SITE MOBILIZATION MEETING

A. Architect Engineer will schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:
1. Contractor.
2. Owner's Representative.
3. Architect Engineer.
4. Special Consultants.
5. Contractor's Superintendent.
6. Major Subcontractors.

C. Agenda: Including, but not necessarily limited to following.
1. Use of premises by Owner and Contractor.
2. Owner's requirements and occupancy prior to completion.
3. Temporary utilities provided by Owner.
4. Survey and building layout.
5. Security and housekeeping procedures.
6. Schedules.
7. Application for payment procedures.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Requirements for start-up of equipment.
11. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

3.03 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required: Job superintendent, Major Subcontractors and suppliers, Owner's Representative, Architect Engineer, as appropriate to agenda topics for each meeting.

D. Agenda: Including, but not necessarily limited to following.
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

3.04 SUBMITTALS

A. Submit to the Architect such shop drawings, data, and schedules as are required by the specifications, General Conditions or that are reasonably requested by the Architect. Submittals shall be coordinated by the Contractor and prepared by a person thoroughly competent and qualified to prepare submittals and shop drawings. Incomplete or poorly prepared submittals and shop drawings are subject to being returned to the Contractor to be redrawn and resubmitted.

3.05 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect Engineer's responsive action.

B. Informational Submittals: Written information that does not require Architect Engineer's responsive action. Submittals may be rejected for not complying with requirements.

3.06 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
   1. Besides submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect Engineer are required to use this service.
   3. It is Contractor's responsibility to submit documents in PDF format.
   4. Subcontractors, suppliers, and Architect Engineer's consultants will be permitted to use the service at no extra charge.
   5. Users of the service need an email address and Internet access.
   6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
   7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The use of the Cromwell Architect Engineer's Newforma Information Exchange service will be provided without charge. A valId email address is required for access. Contact PRINTSHOP@CROMWELL.COM.

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Cromwell Architect Engineer and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Cromwell Architect Engineer will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.07 SUBMITTAL PROCEDURES

A. Thoroughly review, coordinate, and stamp submittals prior to submission to Architect Engineer.

B. Transmit submittals to Architect Engineer for delivery to Owner.

C. The Architect Engineer may request submittals in addition to those specified when deemed necessary to adequately describe the Work covered in the respective sections.

D. General: Electronic pdf or live copies of 2-D CAD Drawings of the Contract Drawings may be obtained from Architect Engineer upon payment of a fee (at standard rates) for Contractor's use in preparing submittals, unless otherwise indicated. Contact PRINTSHOP@CROMWELL.COM

E. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
   3. Submittals for finishes and colors shall be coordinated and submitted at the same time.

F. Basis Of Design:
   1. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design. Submit a request for substitution for any product not indicated.
   2. Substitutions will not be considered for finishes and colors unless all finishes and colors are coordinated and submitted together.

G. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Schedule" for list of submittals and time requirements for scheduled performance of related construction activities.

H. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with other Contractors and/or subsequent submittals is required. Architect Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect Engineer's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

I. Identification: Place a permanent label or title block on each submittal for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect Engineer.
3. Include the following information on label for processing and recording action taken:
    a. Project name.
    b. Architect Engineer's project number.
    c. Owner's project number.
    d. Date.
    e. Name and address of architect.
    f. Name and address of contractor.
    g. Name and address of subcontractor.
    h. Name and address of supplier.
    i. Name of manufacturer.
    j. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    k. Number and title of appropriate Specification Section.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Other necessary identification.

J. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

K. Copies: Minimum one hard copy and electronic file. Hard copy and electronic file shall be identical. In addition, provide number of hard copies indicated in individual technical sections.

L. Additional Copies: Unless additional copies are required for final submittal, and unless Architect Engineer observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect Engineer.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

M. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect Engineer will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Use form acceptable to Architect Engineer.
2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect Engineer on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

N. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are approved.

O. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

P. Use for Construction: Use only final submittals with mark indicating "No Exceptions Taken" by Architect Engineer.

3.08 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections or subsequently requested by Architect Engineer.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's written recommendations.
      b. Manufacturer's product specifications.
      c. Manufacturer's installation instructions.
      d. Standard color charts.
      e. Manufacturer's catalog cuts.
      f. Wiring diagrams showing factory-installed wiring.
      g. Printed performance curves.
      h. Operational range diagrams.
      i. Mill reports.
      j. Standard product operation and maintenance manuals.
      k. Compliance with specified referenced standards.
      l. Testing by recognized testing agency.
      m. Application of testing agency labels and seals.
      n. Notation of coordination requirements.
   4. Submit Product Data before or concurrent with Samples.
   5. Number of Copies: Submit four hard copies and electronic file of Product Data, unless otherwise indicated. No copies will be returned. Mark up and retain one copy as a Project Record Document.

C. Shop Drawings: Prepare Project specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Dimensions.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
      f. Shopwork manufacturing instructions.
      g. Templates and patterns.
      h. Schedules.
      i. Design calculations.
      j. Compliance with specified standards.
      k. Notation of coordination requirements.
      l. Notation of dimensions established by field measurement.
      m. Relationship to adjoining construction clearly indicated.
      n. Seal and signature of professional engineer if specified.
      o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
   2. Sheet Size: Same size as contract drawings, 30 inch x 42 inch maximum.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
4. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect Engineer will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare and maintain a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product.
   2. Number and name of room or space.
   3. Location within room or space.
   4. Number of Copies: Submit three copies of product schedule or list, unless otherwise indicated. Architect Engineer will return two copies.
      a. Mark up and retain one returned copy as a Project Record Document.

F. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use form acceptable to Architect Engineer. Include the following information in tabular form:
   1. Name, address, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.
4. Number of Copies: Submit three copies of subcontractor list, unless otherwise indicated. Two copies will be returned.
    a. Mark up and retain one returned copy as a Project Record Document.

3.09 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated in the individual specification section. Copies will not be returned.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Construction Schedule: Comply with requirements specified in Section 01 32 16 - Construction Progress Schedule

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

K. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

L. Schedule of Tests and Inspections: Comply with requirements specified in Section 01 40 00 - Quality Requirements

M. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

N. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

O. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

Q. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

R. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
   1. Preparation of substrates.
   2. Required substrate tolerances.
   3. Sequence of installation or erection.
   4. Required installation tolerances.
   5. Required adjustments.
   6. Recommendations for cleaning and protection.

S. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
   1. Name, address, and telephone number of factory-authorized service representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
   4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
   6. Statement whether conditions, products, and installation will affect warranty.
   7. Other required items indicated in individual Specification Sections.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

U. Progress Photographs
   1. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Architect Engineer.
   2. In addition to periodic, recurring views, take photographs of each of the following events:
      a. Completion of site clearing.
      b. Excavations in progress.
      c. Foundations in progress and upon completion.
      d. Structural framing in progress and upon completion.

e. Enclosure of building, upon completion.
f. Final completion, minimum of ten (10) photos.

3. Views:
   a. Provide aerial photographs from four cardinal views at each specified time, until structure is enclosed.
   b. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
   c. Consult with Architect Engineer for instructions on views required.
   d. Provide factual presentation.
   e. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.
4. Digital Photographs: 24 bit color, minimum resolution of 1920 by 1080, in JPG or PNG format; provide files unaltered by photo editing software.
   a. Delivery Medium: Electronic delivery by Newforma Information Exchange.
   b. File Naming: Include project identification, date and time of view, and view identification.
   c. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
   d. Photo CD(s): Provide 1 copy including all photos cumulative to date and PDF file(s), with files organized in separate folders by submittal date.

V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect Engineer.
   1. Architect Engineer will not review submittals that include MSDSs and may return them for resubmittal without the MSDSs.

3.10 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect Engineer.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional registered in the State of Arkansas, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

3.11 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Project and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect Engineer.

B. Coordinate submittals with the Project Construction Schedule.

C. Do not indicate "By Others," or words to that effect. Coordinate to indicate the Work of the appropriate trade(s).

D. Approval Stamp: Stamp each submittal with the approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

E. Log each submittal and review for coordination with other Work of the Project and the Project Schedule. Mark with submittal received date stamp before transmitting to Architect Engineer.

F. Coordinate submittals with the Project Constrluction Schedule. When submittals indicate "By Others," or words to that effect, annotate the submittal to indicate the Work of the appropriate trade(s).

G. Deliver submittals promptly to Architect Engineer.

H. Received submittals returned from Architect Engineer.

I. Revise and maintain the Project Construction Schedule as required when resubmittals are required.

3.12 ARCHITECT ENGINEER'S ACTION

A. General: Architect Engineer will not review submittals that are not coordinated or that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect Engineer will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
   1. "No Exceptions Taken".
   2. "Make Corrections Noted".
   3. "Revise and Resubmit".
   4. "Not accepted, see Comments".

C. Informational Submittals: Architect Engineer will review each submittal and will not return it, or may return it if it does not comply with requirements.
   1. Architect Engineer will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and may be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.13 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Consent of Surety.

B. Submit Correction Punch List for Substantial Completion.

C. Submit Final Correction Punch List for Substantial Completion.

D. See Section 01 78 00 - Closeout Submittals for additional project record documents requirements.

E. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Other types as indicated.

F. Submit for Owner's benefit during and after project completion.

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, with network analysis diagrams and reports.

1.02 REFERENCE STANDARDS

A. AGC (CPSM) - Construction Planning and Scheduling Manual; 2004.

1.03 SUBMITTALS

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

F. Submit under transmittal letter form specified in Section 01 30 00 - Administrative Requirements.

1.04 QUALITY ASSURANCE

A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with two years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

B. Contractor's Administrative Personnel: One year minimum experience in using and monitoring CPM schedules on comparable projects.

C. If the Owner or the Architect determines that the performance of the Work is not satisfying the requirements of the accepted construction schedule, the Owner will have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation (i) working additional shifts or overtime, (ii) supplying additional manpower equipment and facilities, and (iii) other similar measures. These measures shall continue until the progress of the Work complies with the stage of completion required by the accepted construction schedule. The Owner’s right to require these measures is solely for the purpose of ensuring the Contractor’s compliance with the accepted construction schedule. In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequence of procedures or for safety precautions and programs in connection with the Work. In no event shall the Owner’s order for the Contractor to take corrective measures as provided herein constitute an adjustment in the Contract Time or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to a written Change Order.

1.05 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 30 x 42 inches or width required.

C. Scale and Spacing: To allow for notations and revisions.

D. The construction schedule shall be in a detailed format satisfactory to the Owner and Architect. If not accepted, the construction scheduled will be revised and re-submitted. The Contractor

shall monitor the progress of the Work relative to the Contract Documents, promptly advise the Owner and Architect of any delays or potential delays and update the accepted construction schedule ("progress report.") The Contractor shall provide an affirmative plan to correct the delay, including without limitation, overtime and/or additional labor if needed. In no event shall any progress report constitute an adjustment in the Contract Time or the Contract Sum unless any such adjustment is agreed to by the Owner and authorized pursuant to a written Change Order.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Provide sub-schedules to define critical portions of the entire schedule.

D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

E. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect Engineer. Indicate decision dates for selection of finishes.

F. Indicate delivery dates for owner-furnished products.

G. Coordinate content with schedule of values specified in Section 01 20 00 - Price and Payment Procedures.

H. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.

B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.

C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
   1. Preceding and following event numbers.
   2. Activity description.
   3. Estimated duration of activity, in maximum 15 day intervals.
   4. Earliest start date.
   5. Earliest finish date.
   6. Actual start date.
   7. Actual finish date.
   8. Latest start date.
   9. Latest finish date.
   10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
   11. Monetary value of activity, keyed to Schedule of Values.
   12. Percentage of activity completed.
   13. Responsibility.

D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and recomputation of all dates and float.

E. Required Reports: List activities in sorts or groups:
   1. By preceding work item or event number from lowest to highest.
   2. By amount of float, then in order of early start.
   3. Listing of activities on the critical path.
   4. Other reports as requested by Owner.

3.05 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect Engineer at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.06 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Update diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.07 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect Engineer, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

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SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contractor's quality-assurance and quality-control procedures, except for Owner's structural tests and special inspections as required in Section 01 45 33 - Special Inspections.

B. Submittals.

C. Quality assurance.

D. References and standards.

E. Testing agencies and services.

F. Control of installation.

G. Mock-ups.

H. Tolerances.

I. Manufacturers' field services.

J. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures.

C. Section 01 45 33 - Special Inspection: Contractor's responsibilities related to Special Inspections.

D. Section 01 45 33 - Special Inspection: Schedule of Inspections that are Owner's responsibility for code required structural tests and special inspections are excluded from the scope of this section.

E. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Architect Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit copies of report to Architect Engineer and to Contractor.
   1. Include:

a. Date issued.
b. Project title and number.
c. Name of inspector.
d. Date and time of sampling or inspection.
e. Identification of product and specifications section.
f. Location in the Project.
g. Type of test/inspection.
h. Date of test/inspection.
i. Results of test/inspection.
j. Conformance with Contract Documents.
k. When requested by Architect Engineer, provide interpretation of results.

2. Test report submittals are for Architect Engineer's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect Engineer, in quantities specified for Product Data.
1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect Engineer.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect Engineer's benefit as contract administrator or for Owner.
1. Submit report in duplicate within 30 days of observation to Architect Engineer for information.
2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect Engineer before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor shall employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Exception: Structural tests and other special inspections as required in Section 01 45 33 - Special Inspections.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, and ASTM C1093.
   2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
   3. Laboratory: Authorized to operate in the State of Arkansas.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

E. The International Building Code, Chapter 17 may require the use of an Inspector-of-Record for the structural portions of the work. The Inspector-of-Record shall be approved by the Architect Engineer-of-Record and Contractor. The cost for this special inspector will be born by the Contractor, but the inspector shall report to the identities above in addition to the Contractor and authority having jurisdiction. The special inspector shall carry out the duties assigned in Chapter 17 as determined by the Architect Engineer-of-Record. Testing and inspection requirements and a quality assurance plan when required by Chapter 17 of the International Building Code shall be as indicated on the drawings and Section 01 45 33.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect Engineer and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect Engineer.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect Engineer and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect Engineer and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Architect Engineer.
   6. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work .
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Architect Engineer and laboratory 48 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect Engineer.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

G. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect Engineer 30 days in advance of required observations.
   1. Observer subject to approval of Architect Engineer.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION

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SECTION 01 42 16
DEFINITIONS

1.01 GENERAL: BASIC CONTRACT DEFINITIONS ARE INCLUDED IN THE CONDITIONS OF THE CONTRACT.

A. OWNER is the person or entity identified in the Agreement and shall be as referring to the Owner, its employees, or its authorized representative(s).

B. DESIGN PROFESSIONAL of record is the person or entity identified in the Agreement and is referred to as the Architect Engineer, its employees, or its authorized representative(s).

C. DESIGNER is used interchangeably with the term Architect Engineer and shall be as referring to the Architect Engineer.

D. ARCHITECT is used interchangeably with the term Architect Engineer and shall be as referring to the Architect Engineer.

E. ARCHITECT ENGINEER is the firm of CROMWELL ARCHITECTS ENGINEERS, INC., Architects Engineers, 101 S. Spring, Little Rock, Arkansas 72201-2490, Telephone 501-372-2900, Email: Cromwell@Cromwell.com, and shall be as referring to the Architect Engineer, its employees, or its authorized representatives, or its consultants, their employees, or authorized representatives.

F. CONSTRUCTION MANAGER is Adam Seiter, Project Manager, Nabholz Construction Services, 1608 West Washington, Jonesboro, AR 72401 or its authorized representative, identified as such in the Contract Documents, is the Owner's Construction Manager for this Project. Telephone: 870-934-4800.

G. TRADE CONTRACTOR is the person or entity identified in the Agreement, or its authorized representative, identified as such in the Contract Documents, has a direct contract with the Owner to perform the Contract Work identified as a specific portion of the total Project. Within the limits of the Work assigned to a Trade Contractor, the term "Contractor" shall have the same meaning as "Trade Contractor."

H. SUPPLY CONTRACTOR is the person or entity identified in the Agreement, or its authorized representative, identified as such in the Contract Documents, has a direct contract with the Owner to supply items for the Contract Work identified as a specific portion of the total Project. Within the limits of the Work assigned to a Supply Contractor, the term "Contractor" shall have the same meaning as "Supply Contractor."

1. Suppliers that sign a prime contract with the Owner are a "Contractor" as defined in the Contract Documents and shall comply with all requirements of a Contractor, including, but not necessarily limited to insurance, performance bonds and payment bonds, and other applicable contract and general requirements.

I. SUBCONTRACTOR is a person or organization, or his authorized representative, who has a direct contract with the Contractor to perform any of the Work at the Project Site.

J. CONTRACT DOCUMENTS consists of: the Agreement, the Drawings and Specifications, including all modifications thereof incorporated in the documents before their execution, and accepted elements of the Contractor's Proposal. Each item in Contract Documents complements each of the other Contract Documents. No sheet, section, or document is to be followed without referring to all sheets, sections, and parts of the Contract Documents.

K. DRAWINGS are one or more volumes of sheets that indicate size, form, quantity, relationship, generic type, and graphic representation of construction materials. References to plans and design drawings are used interchangeably with the term drawings and shall be as referring to the Drawings.

L. PROJECT MANUAL is one or more volumes including the specifications and the conditions of the contract as well as other documents such as the bidding requirements and contract forms.

M. SURETY firm or corporation that has executed as Surety, the Contractor's Performance Bond, securing the performance of the Contract.

N. WRITTEN NOTICE shall be deemed to have been given if delivered in person to the individual or corporate office designated in writing by each party, or sent by certified mail to the last business address known to the party giving the notice.

O. ALL TIME LIMITS stated in the Contract Documents are to the essence of the Contract.

P. PROJECT refers to the improvements which are the subject of and described in the Contract Documents and mentioned as such in the Agreement.

Q. WORK of the Contractor and Subcontractor includes all materials, labor, tools, equipment, apparatus, controls, services, transportation and related items which are necessary or customarily furnished for proper and complete construction, erection and installation of all materials, equipment and systems indicated on Drawings and described in the Specifications.

R. EXTRA WORK refers to and includes any work required by the Owner which is in addition to that required by the Contract Documents in their present form.

S. CHANGE ORDER shall mean the duly accepted authorized and approved order of the Owner instructing the Contractor to make changes in the Contract.

T. SUBSTANTIAL COMPLETION of the Project or a specified area of the Project is the date when construction is sufficiently completed, in accordance with the Contract Documents, as modified by any Change Orders agreed to by the parties, so that the Owner can occupy the Project or specified area of the Project for the use for which it was intended.

U. FINAL ACCEPTANCE of the Project is the date when construction is complete, in accordance with the Contract Documents, as modified by any Change Orders agreed to by the parties, and certified by the Architect Engineer by issuance of a "Certificate of Completion".

V. DAYS refer to number of calendar days, unless specifically noted otherwise.

W. INDICATED: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Project Manual and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

X. DIRECTED: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect Engineer, requested by the Architect Engineer, and similar phrases.

Y. APPROVED: The term "approved," when used in conjunction with the Architect Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Architect Engineer's duties and responsibilities as stated in the Conditions of the Contract.

Z. REGULATIONS: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

AA. FURNISH: The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

AB. SUPPLY: The same as "furnish."

AC. INSTALL: The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

AD. PROVIDE: The term "provide" means to furnish and install, complete and ready for the intended use.

AE. INSTALLER: An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

AF. The term "experienced," when used with the term "installer," means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

AG. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

AH. Assigning Specialists: Certain Sections of the Specifications may require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

1. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

AI. PROJECT SITE is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

AJ. TESTING AGENCIES: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION

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SECTION 01 45 33
SPECIAL INSPECTIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, may apply to this Section.

B. Section 01 40 00 - Quality Requirements. Requirements for Contractor performed independent tests and inspections that are normally Contractor's responsibility and are not specifically indicated within the requirements of this section.

1.02 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Special Inspections and Tests.

B. Special inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Construction Document requirements.
   1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the construction document requirements.
   3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this section.

C. The Owner will engage one or more qualified special inspectors and / or testing agencies to conduct special inspections and tests specified in this section and related sections and as maybe specified in other divisions of these specifications.

D. Refer to Statement of Special Inspections and forms following the end of this section for the inspection and testing requirements and forms to be utilized by the Contractor and inspectors.

E. Related Sections include but are not limited to the following:
   1. 014000 - Quality Requirements
   2. 032000 - Concrete Reinforcing
   3. 033000 - Cast-in-Place Concrete
   4. 042731 - Reinforced Unit Masonry
   5. 052100 - Steel Joist Framing
   6. 053100 - Steel Decking
   7. 054000 - Cold-Formed Metal Framing
   8. 055000 - Metal Fabrications
   9. 055213 - Pipe and Tube Railings
   10. 133419 - Metal Building Systems
   11. 210548 - Fire Suppression Vibration Isolation and Seismic Restraint
   12. 312323 - Fill

1.03 RELATED STANDARDS

A. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2013

B. ICC (IBC) - International Building Code; 2012.

C. SEAoAR SI GL 02 - 01/01/2014; Arkansas Special Inspections Guidelines; www.SEAoAR.org.

D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010

1.04 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

C. Designated Seismic System: Those architectural, electrical and mechanical systems and their components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, Ip, is greater than 1 in accordance with Section 13.1.3 of ASCE 7.

D. Registered Design Professional in Responsible Charge: The individual that prepares the Statement of Special Inspections including a Schedule of Special Inspection Services as part of the general requirements Section 1704 of the Building Code. The Registered Design Professional for special inspections is typically the project architect. The architect will take input from the structural, mechanical and electrical engineers and act as the overall Registered Design Professional in Responsible Charge of preparing the Statement of Special Inspections.

E. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

F. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.

G. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

H. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

I. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E 329 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
      a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the Building Official for consideration before proceeding with work.
   2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.06 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the

most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

C. The special inspector's reports and testing agencies results shall have precedence over reports and test results provided by the Contractor.

D. Where a conflict exists between the Construction Documents and approved shop drawings / submittal data, the Construction Documents shall govern, unless the approved shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the Registered Design Professional in Responsible Charge.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SPECIAL INSPECTOR (TESTING AGENCIES) RESPONSIBILITIES

A. The Special Inspectors shall:
   1. Notify the Contractor of their presence and responsibilities at the job site.
   2. Observe assigned work for which they are responsible for conformance with the plans and specifications and approved submittals for work designed by the Contractor.
   3. Report nonconforming items to the immediate attention of the Contractor for correction.
   4. Write a discrepancy report about each nonconforming item containing:
      a. Description and exact location.
      b. Reference to applicable drawings and specifications.
      c. Resolution or corrective action taken and the date.
   5. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and to the Registered Design Professional In Responsible Charge prior to the completion of that phase of the work.
   6. Provide special inspection reports directly to the Design Professional, the Contractor and the Building Official at the intervals indicated on the Statement of Special Inspections. The reports should:
      a. Describe the special inspection and tests made, with locations.
      b. Indicate nonconforming items and their resolution.
      c. List unresolved items and parties notified.
      d. Itemize any changes authorized by the Design Professional.
   7. Initial and date the "Date Completed" box in the Schedule of Special Inspection Services as the inspection and testing activities are completed.
   8. Submit a final signed report stating that all required special inspections and testing were fulfilled and reported and that any outstanding discrepancies have been corrected.

3.02 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be familiar with Chapter 17 of the International Building Code.

B. The Contractor shall coordinate the inspection and testing services with the progress of the work. The Contractor shall provide sufficient notice to allow proper scheduling of all personnel. The Contractor shall provide safe access for performing inspection and on site testing.

C. The Contractor shall provide and maintain project schedules to the Owner, Registered Design Professionals and testing and inspecting agencies. Project schedules shall indicate milestones and durations of time for materials requiring structural tests and special inspections, including retesting or reinspections required.

D. Notify special inspectors 72 hours prior to expected time for operations requiring testing/inspection services.

E. Provide Special Inspectors direct access to the approved plans and specifications for the project, including modifications.

F. Deliver samples for testing when needed.

G. Cooperate with special inspectors, and provide access to the Work .

H. Provide incidental labor and facilities:
   1. To provide access to Work to be tested/inspected.
   2. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   3. To facilitate tests/inspections.
   4. To provide storage and curing of test samples.

I. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified special inspection requirements.

J. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified special inspection requirements.

K. Maintain the Schedule of Special Inspection Services at the project site and submit a copy to the Design Professional and the Building Official when all the services are complete.

L. The Contractor shall submit certification as an Approved Fabricator prior to any shop fabrication of load-bearing members and assemblies, where the fabricator requests to perform such work without special inspection.

M. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections Requirements for Seismic Resistance shall submit a written Contractor’s Statement of Responsibility to the Building Official and to the Owner prior to the commencement of work on the system or component. The Contractor’s Statement of Responsibility shall contain the following:
   1. Acknowledgement of the awareness of the special requirements contained in the Statement of Special Inspections.
   2. Acknowledgement that control shall be exercised to obtain conformance with the construction documents approved by the Building Official.
   3. Procedures for exercising control within the Contractor’s organization, the method and frequency of reporting and the distribution of the reports.
   4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

N. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the Statement of Special Inspections Requirements for Tornado Resistance shall submit a written statement of responsibility to the Building Official and the Owner prior to the commencement of work on the system or component. The Contractor’s Statement of Responsibility shall contain the following:
   1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan.
   2. Acknowledgement that control shall be exercised to obtain conformance with the Construction Documents approved by the Building Official.
   3. Procedures for exercising control within the contractor’s organization, the method and frequency of reporting and the distribution of the reports.
   4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

O. The Contractor shall repair and / or replace work that does not meet the requirements of the Construction Documents.
   1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.

2. Engineer / architect shall be registered in the State of Arkansas. Engineer / architect shall be acceptable to the Registered Design Professional in Responsible Charge, Building Official, and Owner.
3. Procedures shall be submitted for review and acceptance by the Registered Design Professional in Responsible Charge, Building Official, and Owner before proceeding with corrective action.

P. The Contractor shall be responsible for costs of:
1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the Construction Documents and shop drawings / submittal data.
2. Review of proposed repair and / or replacement procedures by the Registered Design Professional in Responsible Charge and the inspectors and testing agencies.
3. Repair or replacement of work that does not meet the requirements of the Construction Documents.

Q. The Contractor shall maintain one copy of all shop drawings indicating seismic restraint design for all designated seismic systems, for special inspector's use, at the jobsite.

3.03 INSPECTION AND TESTING

A. Inspection and Testing shall be in accordance with the attached Schedule of Special Inspection Services.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings and as required by reference standards indicated in IBC Chapter 17.

3.04 SCHEDULES AND FORMS (INCLUDED FOLLOWING THE END OF THIS SECTION)

A. STATEMENT OF SPECIAL INSPECTIONS.
1. The Statement of Special Inspections is included as an attachment to this section. This form provides the general project information. It identifies the project location, the architect of record, the structural, mechanical, and electrical engineers, the Registered Design Professional in Responsible Charge, and Special Inspection Requirements for Seismic or Wind Resistance.
2. The Contractor shall submit the Statement of Special Inspections with the application for the building permit and have the Building Official sign, date, and shall add the building permit number to the statement. The Contractor shall send a copy of the completed document to the Architect Engineer, Owner, Building Official, and keep a copy in the job site office.

B. SCHEDULE OF SPECIAL INSPECTION SERVICES.
1. The Schedule of Special Inspection Services is included as an attachment to this section. This form provides a detailed and itemized list of which special inspection activities are required for the specific project and which individuals, firm, or agency will be performing the special inspection services associated with each required task.
2. The Contractor shall maintain the schedule at the project site. When an individual special inspection task in the schedule is completed for the last time on the project and the special inspector performed their final review, inspection, or test of that item for the project, the special inspector shall initial and date the cell in the "Completed" column adjacent to the task. The schedule shall be maintained by the Contractor at the project site.
3. At the conclusion of the project a copy of the Schedule of Special Inspection Services form with the initials and date in the "Completed" column for each task relevant to the project shall be submitted, by the Contractor, to the Design Professional in Responsible Charge and the Building Official for comparison with the Final Reports of Special Inspections.

C. FINAL REPORT OF SPECIAL INSPECTIONS.
1. The form for the final report of Special Inspections is included as an attachment to this section. This form is submitted by each inspector when all the special inspection requirements they are responsible for on the project have been fulfilled and all noted deficiencies have been corrected. Each special inspector corresponding to an agent

number in the Schedule of Special Inspection Services will be required to complete a copy of this form.

2. The special inspectors shall provide 3 bound copies of the special inspection interim reports with the final report of special inspections serving as the cover sheet. The copies shall be submitted to the Design Professional in Responsible Charge and Building Official within 2 weeks of completion of the special inspection program. The special inspection program will not be considered complete until forms from all agents have been submitted and received.

D. CONTRACTOR'S STATEMENT OF RESPONSIBILITY.
   1. The form for the Contractor's Statement of Responsibility is included as an attachment to this section.
   2. Each contractor responsible for the construction or fabrication of a seismic force resisting system, designated seismic system or component, listed in the Statement of Special Inspections - Requirements for Seismic Resistance, shall submit a written statement of responsibility to the Building Official and Design Professional in Responsible Charge prior to the commencement of work on the system or component.
   3. Each contractor responsible for the construction or fabrication of a main wind force resisting system or a wind force resisting component listed in the Statement of Special Inspections - Requirements for Tornado Resistance, shall submit a written statement of responsibility to the Building Official and Design Professional in Responsible Charge prior to the commencement of work on the system or component.
   4. Contractor's Statements of Responsibility shall be submitted to the Design Professional in Responsible Charge for approval along with the design submittal for the associated work.

E. FABRICATOR'S CERTIFICATE OF COMPLIANCE.
   1. The form for the approved Fabricator's Certificate of Compliance is included as an attachment to this section.
   2. Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.2 of the Building Code must submit Fabricator's Certificate of Compliance at the completion of fabrication to the Contractor.
   3. The Contractor shall submit Fabricator's Certificates of Compliance for approved fabricators to the Design Professional in Responsible Charge and the Building Official.

F. MINIMUM SPECIAL INSPECTOR QUALIFICATIONS.
   1. This document is included as an attachment to this section.
   2. This document lists the Structural Engineers Association of Arkansas (SEAoAR)'s recommended minimum qualifications for special inspectors.
   3. The final approval of an inspector shall be determined by the building official.

G. OTHER SPECIAL INSPECTION REPORT AND NOTICE FORMS.
   1. Forms for Special Inspection Reports and Discrepancy Notices are included as attachments to this section.

END OF SECTION

STATEMENT OF SPECIAL INSPECTIONS

(Completed by the Registered Design Professional in Responsible Charge)

PROJECT: BIC Monette School 7-12

LOCATION: Monette, Arkansas

PERMIT APPLICANT:

APPLICANT'S ADDRESS:

ARCHITECT OF RECORD:

STRUCTURAL ENGINEER OF RECORD: Jordan Lane

MECHANICAL ENGINEER OF RECORD: Corey Imhoff

ELECTRICAL ENGINEER OF RECORD: Pam McElrath

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE:

This Statement of Special Inspections is submitted in accordance with Section 1704.3 of the 2012 Arkansas Fire Prevention Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Tornado Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__Weekly X_Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Statement of Special Inspections Prepared by:

_____
Type or print name

_____
Signature Date

Building Official's Acceptance:

_____
Signature Date

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion Other; specify:_____

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Statement of Special Inspections
Requirements for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements.

Seismic Design Category: D

Statement of Special Inspection for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Required for Seismic Design Categories C, D, E or F in accordance with Building Code Section 1705.11.1 through 1705.11.3, 1705.12.1 and 1705.12.2.)

Ordinary Moment Frames

Description of designated seismic systems subject to special inspection, testing and qualification for seismic resistance:
(Required for architectural, electrical and mechanical systems and their components that require design in accordance with ASCE 7-10 Chapter 13, have a component importance factor, *Ip*, greater than one and are in Seismic Design Categories C, D, E or F, in accordance with Building Code Section 1705.11.4 and 1705.12.3.)

Fire Protection Sprinkler Pipe System

Description of additional components and systems requiring special inspections, testing and qualification for seismic resistance:
(Required for systems noted in Building Code Section 1705.11, cases 3, 4 & 5 ***or*** Section 1705.12, cases 3 & 4, in Seismic Design Category C,D,E or F)

Emergency lighting
Natural Gas piping and equipment

Statement of Responsibility:

Each contractor responsible for the construction or fabrication of a system or component described above must each submit a Statement of Responsibility (pg C1) in accordance with Building Code Section 1704.4.

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Statement of Special Inspections
Requirements for Tornado Resistance

See the Schedule of Special Inspections for inspection and testing requirements

Design Wind Speed: 250 m.p.h.
(The tornado design wind speed is 250 miles per hour for the entire state of Arkansas per FEMA P-361.)

Wind Exposure Category: C
(Wind Exposure Category C should be used to calculate wind pressures acting on community safe rooms and tornado shelters designed and constructed in accordance with FEMA P-361.)

Statement of Special Inspection for Tornado Resistance Required (Yes/No): No
(Required for community safe rooms and tornado shelters designed and constructed in accordance with FEMA P-361.)

Not designed to FEMA P-361 standards

Description of main wind force-resisting system subject to special inspection for wind resistance:
(Required for systems noted in Building Code Section 1705.10.1 and 1705.10.2)

Roof slab and masonry shear walls

Description of wind force-resisting components subject to special inspection for wind resistance:
(Required for systems noted in Building Code Section 1705.10.3)

Roof Cladding
Walls Cladding

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must each submit a Statement of Responsibility (pg C1) in accordance with Building Code Section 1704.4.

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SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
1705.2 Structural Steel Construction					
1.. Material verification of structural steel	Shop (3) and field inspection		Periodic		
2. Anchor Rods and other Embedment(s) (Verify diameter, grade, type, length, embedment. See 1705.3 for anchors)	Field inspection		Continuous		
3. Verify member locations, braces, stiffeners, and application of joint details at each connection comply with construction documents	Field inspection		Periodic		
4. Structural steel welding:					
a. Inspection tasks Prior to Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-1)	Shop (3) and field inspection		Observe or Perform as noted (4)		
b. Inspection tasks During Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-2)	Shop (3) and field inspection		Observe (4)		
c. Inspection tasks After Welding (Observe, or perform for each welded joint or member, the QA tasks listed in AISC 360, Table N5.4-3)	Shop (3) and field inspection		Observe or Perform as noted (4)		
d. Nondestructive testing (NDT) of welded joints: *see Commentary*					
1) Complete penetration groove welds at joints in materials 5/16" thick or greater	Shop (3) or field ultrasonic testing - 100%		Periodic		
2) Thermally cut surfaces of access holes when material t > 2"	Shop (3) or field magnetic Particle or Penetrant testing		Periodic		
3) Fabricator's NDT reports when fabricator performs NDT	Verify reports		Each submittal (5)		
5. Structural steel bolting:	Shop (3) and field inspection				
a. Inspection tasks Prior to Bolting (Observe, or perform tasks for each bolted connection, in accordance with QA tasks listed in AISC 360-10, Table N5.6-1)			Observe or Perform as noted (4)		
b.Inspection tasks During Bolting (Observe the QA tasks listed in AISC 360-10, Table N5.6-2)			Observe (4)		
1) Pre-tensioned and slip-critical joints					
a) Twist-off type tension control bolt			Periodic		
2) Snug-tight joints			Periodic		
3) Metal building columns to supporting steel structure			Continuous		

SCHEDULE OF SPECIAL INSPECTION SERVICES					
PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	**SERVICE**	**Y/N**	**EXTENT**	**AGENT***	**DATE COMPLETED**
c. Inspection tasks After Bolting (Perform tasks for each bolted connection in accordance with QA tasks listed in AISC 360, Table N5.6-3)			Perform (4)		
1705.2.2 Steel Construction Other Than Structural Steel					
1. Material verification of cold-formed steel deck:					
a. Identification markings	Field inspection		Periodic		
b. Manufacturer's certified test reports	Submittal Review		Each submittal		
2. Connection of cold-formed steel deck to supporting structure:	Shop (3) and field inspection				
a. Welding			Periodic		
b. Other fasteners (in accordance with AISC 360,Section N6)					
1) Verify fasteners are in conformance with approved submittal			Periodic		
2) Verify fastener installation is in conformance with approved submittal and manufacturer's recommendations			Periodic		
1705.3 Concrete Construction					
1. Inspection of reinforcing steel placement	Field inspection		Periodic		
2. Inspection of anchors cast in concrete	Field inspection		Continuous		
3. Inspection of anchors and reinforcing steel post-installed in hardened concrete: Per research reports requirements	Field inspection		Periodic or as required by the research report issued by an approved source		
4. Verify use of approved design mix	Field inspection		Periodic		
5. Fresh concrete sampling, perform slump and air content tests and determine temperature of concrete	Field inspection		Continuous		
6. Inspection of concrete placement for proper application techniques	Field inspection		Continuous		
7. Inspection for maintenance of specified curing temperature and techniques	Shop (3) and field inspection		Periodic		
8. Inspection of formwork for shape, lines, location and dimensions	Field inspection		Periodic		
9. Concrete strength testing and verification of compliance with construction documents	Field testing and review of laboratory reports		Periodic		
1705.4 Masonry Construction					
1. Verify compliance with approved submittals	Field Inspection		Periodic		
2. Verification of f'_m prior to construction and for every 5,000 SF during construction	Testing by unit strength method or prism test method		Periodic		
3. Verification of proportions of materials in premixed or preblended mortar and grout as delivered to the project site	Field inspection		Continuous		
4. Verify placement of masonry units	Field Inspection		Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
5. Verify proportions of site-mixed mortar and grout	Field Inspection		Periodic		
6. Verify grade, type, and size of reinforcement and anchor bolts, and prestressing tendons and anchorages	Field Inspection		Periodic		
7. Verify construction of mortar joints	Field Inspection		Periodic		
8. Verify placement of reinforcement, connectors and anchorages	Field Inspection		Periodic		
9. Verify grout space prior to	Field Inspection		Periodic		
10. Verify placement of grout	Field Inspection		Continuous		
11. Verify size and location of structural masonry elements	Field Inspection		Periodic		
12. Verify type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	Field inspection		Periodic		
13. Verify preparation, construction, and protection of masonry during cold weather (temperature below 40^{o} F) or hot weather (temperature above 90^{o} F)	Field inspection		Periodic		
14. Prepare grout and mortar specimens	Field testing		Periodic		
1705.6 Soils					
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	Field inspection		Periodic		
2. Verify excavations are extended to proper depth and have reached proper material.	Field inspection		Periodic		
3. Perform classification and testing of controlled fill materials.	Field inspection		Periodic		
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of compacted fill	Field inspection		Continuous		
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly	Field inspection		Periodic		
1705.10.3 Wind-resisting Components					
1. Roof cladding	Shop (3) and field inspection		Periodic		
2. Wall cladding	Shop (3) and field inspection		Periodic		
1705.11.4 Designated Seismic System Verification					
Inspect and verify that that the component label, anchorage or mounting conforms to the certificate of compliance in accordance with 1705.12.3	Field inspection		Periodic		
1. Mechanical & Electical Designated Seismic Systems (per ASCE 7-10)					
a. Mechanical and Electrical Components					
b. Distribution Systems					
1) Fire Protection Sprinkler Pipe System	Field Inspection		Periodic		

SCHEDULE OF SPECIAL INSPECTION SERVICES

PROJECT	(Completed by the Registered Design Professional in Responsible Charge)				
		APPLICABLE TO THIS PROJECT			
MATERIAL / ACTIVITY	SERVICE	Y/N	EXTENT	AGENT*	DATE COMPLETED
1705.11.6 Mechanical and Electrical Components Special Inspections for Seismic Resistance					
1. Inspection during the anchorage of electrical equipment for emergency lighting.	Field inspection		Periodic		
2. Inspection during installation and anchorage of piping systems designed to carry natural gas, and their associated mechanical units	Field inspection		Periodic		
3. Inspection during the installation and anchorage of ductwork designed to carry hazardous materials	Field inspection		Periodic		
1705.11.7 Storage Racks for Seismic Resistance					
Inspection during the anchorage storage racks 8 feet or greater in height.	Field inspection		Periodic		
1705.12.2 Structural Steel Testing and Qualification for Seismic Resistance					
Test in accordance with the quality assurance requirements of AISC 341-10	Shop (3) and field testing		Per AISC 341		
1705.16 Fire-Resistant Penetrations and Joints					
1. Inspect penetration firestop	Field testing		Per ASTM E 2174		
2. Inspect fire-resistant joint systems	Field testing		Per ASTM E 2393		

* INSPECTION AGENTS	FIRM	ADDRESS	TELEPHONE NO.
1.			
2.			
3.			
4.			
5.			

Notes: 1. The inspection and testing agent(s) shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official prior to commencing work. The qualifications of the Special Inspector(s) and/or testing agencies are subject to the approval of the Building Official and/or the Design Professional.

2. The list of Special Inspectors may be submitted as a separate document, if noted so above.

3. Special Inspections as required by Section 1704.2.5 are not required where the fabricator is approved in accordance with IBC Section 1704.2.5.2

4. Observe on a random basis, operations need not be delayed pending these inspections. Perform these tasks for each welded joint, bolted connection, or steel element.

5. NDT of welds completed in an approved fabricator's shop may be performed by that fabricator when approved by the AHJ. Refer to AISC 360, N7.

Circle "Yes" or "No" as appropriate and date this document below:

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*? **Yes** **No**

Are *Requirements for Tornado Resistance* included in the *Statement of Special Inspections*? **Yes** **No**

DATE:

FINAL REPORT OF SPECIAL INSPECTIONS

(Completed by each Special Inspector)

PROJECT: _____

LOCATION: _____

PERMIT APPLICANT: _____

APPLICANT'S ADDRESS: _____

_____

ARCHITECT OF RECORD: _____

STRUCTURAL ENGINEER OF RECORD: _____

MECHANICAL ENGINEER OF RECORD: _____

ELECTRICAL ENGINEER OF RECORD: _____

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE: _____

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents and approved design revisions.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered ___ to ___ form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

_____

_____

_____

_____

_____

(Attach 8 ½"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

_____

Special Inspection Agent/Firm

_____

Type or print name of Special Inspector

_____

Signature Date

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Contractor's Statement of Responsibility

Each contractor responsible for the construction or fabrication of a main wind- or seismic force-resisting system, designated seismic system or a wind- or seismic-resisting component listed in the Statement of Special Inspections (Requirements for Seismic or Tornado Resistance) must submit a Statement of Responsibility, in accordance with the Building Code, Section 1704.4.

Project: _____

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

_____
_____
_____
_____
_____
_____
_____

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to achieve conformance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement

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Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.2 of the Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: _____

Fabricator's Name: _____

Address: _____

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

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MINIMUM SPECIAL INSPECTOR QUALIFICATIONS

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
1704.2.5 Inspection of Fabricators				
Pre-cast concrete	A, C, E			
Structural steel construction	C, F, G			
Wood construction	A, N			
Cold formed metal construction	A, N			
1705.2 & 1705.11.1 Steel Construction				
Welding	C, F, G	C, F, G	A	A
High strength bolting, inspection of steel frame joint details		A, C	A	A
1705.2.2, 1705.10.2 & 1705.11.3 Steel Construction other than Structural Steel				
Welding	C, F, G	C, F, G	A	A
Screw attachment, bolting, anchoring and other fastening		A, C	A	A
1705.3 & 1705.12.1 Concrete Construction				
Reinforcing placement, cast-in-place bolts, post installed anchors, concrete and shotcrete placement and curing operations		A, C, H		
Pre-stressing steel installation		A, C, D, E		
Erection of pre-cast concrete members		A, C, H, Q		
Concrete field testing		A, C, H, I, J		
Review certified mill reports and design mixes			A	
Verify use of required design mix		A, C, H, I, J		
Pre-stressed (pre-tensioned) concrete force application	A, C, E			
Post-tensioned concrete force application		A, C, D, H		
Review of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs		A, C, D		
Reinforcing steel weldability, reinforcing welding, weld filler material		C, F, G		
1705.4 Masonry				
Review f'_m prior to construction			A	
Mortar joint construction, grout protection and placement, materials proportion, type/size/location of reinforcement, structural elements, anchorage, and connectors		A, C, K		
Sampling/testing of grout/mortar specimens		A, C, K		
Observe preparation of masonry prisms for testing of compressive strength of masonry, f'_m		A, C, K		
Inspection of welding of reinforcing steel		C, F, G		
1705.6 Soils				
Observe site preparation, fill placement and testing of compaction for compliance with the construction documents for the project		A, C, I, R		
Observe and test bearing materials below shallow foundations for ability to achieve design bearing capacity		A, L		
Review compaction testing for compliance with the construction documents for the project				A

(Table continued on next page)

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*

Category of Testing and Inspection	Minimum Qualifications (refer to key at end of Table)			
	Shop Inspection	**Field Testing /Inspection**	**Review Submittals**	**Review Testing, Certification, & Lab Reports**
1705.5, 1705.10.1 & 1705.11.2 Wood Construction				
Observe structural panel sheathing, size of framing members, fastener diameter and length, number of fastener lines, and spacing of fastener lines and fasteners for compliance with construction documents for the project		A, N		
1705.7, 1705.8 & 1705.9 Driven Deep, Cast-in-place Deep, and Helical Pile Foundations				
Observe installation		A, L, I		
Observe load tests		A, I		
1705.10.3 Wind Resisting Components				
Inspect roof cladding		A, B, C		
Inspect wall cladding		A, B, C		
1705.11.4 Designated Seismic Systems				
Examine designated seismic systems requiring seismic qualification and verify that the label, anchorage or mounting conform to the certificate of compliance		A	A	A
1705.11.5 & 1705.11.7 Architectural Components				
Inspection of exterior cladding, non-load bearing walls, veneer, access floors and storage racks		A, B	A, B	A, B
1705.11.6 & 1705.12.3 Mechanical and Electrical Components				
Inspection of anchorage of mechanical and electrical components		A	A	A
1705.13 Sprayed Fire-Resistant Materials				
Observe surface conditions, application, average thickness and density of applied material, and cohesive/adhesive bond		A, C		
1705.14 Mastic and intumescent fire-resistant coatings				
Observe application compliance with AWCI 12-B		A, C		
1705.15 Exterior Insulation and Finish Systems				
Inspect EIFS systems		A, B, C, M		
1705.16 Fire-resistant penetrations and joints				
Inspection of Penetration firestops		A, C, P		
Inspection of Fire-resistant joint systems		A, C, P		
[F] 1705.17 Smoke Control	*See Requirements of Building Code Section [F] 1705.17.2.*			

(Table continued on next page)

MINIMUM SPECIAL INSPECTOR QUALIFICATIONS *(continued)*

KEY:

A. Arkansas Professional Engineer (AR PE) competent in the specific task area or graduate of accredited engineering/engineering technology program under the direct supervision of an AR PE.
B. Arkansas Registered Architect (AR RA) competent in the specific task area or graduate of accredited architecture/architecture technology program under the direction of an AR RA.
C. International Code Council (ICC) Special Inspector Certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
D. Post-tensioning Institute (PTI) Certification, Level 2.
E. Pre-stressed Concrete Institute (PCI) Plant Quality Personnel Certification – Level III.
F. American Welding Society (AWS) Certified Welding Inspector (CWI) or AWS Certified Associate Welding Inspector working under the direct on-site supervision of a CWI.
G. American Society for Nondestructive Testing (ASNT) Level II certification, or a Level III certification if previously certified as a Level II in the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
H. American Concrete Institute (ACI) Concrete Construction Special Inspector.
I. National Institute for Certification in Engineering Technologies (NICET) Level II or higher certification specific to the particular material and testing methodology applicable to each Category of Testing and Inspection listed in the table.
J. ACI Concrete Field Testing Technician with Grade 1 certification or Center for Training Transportation Professionals (CTTP) Certified Concrete Field Testing Technician.
K. National Concrete Masonry Association (NCMA) Certified Concrete Masonry Testing Technician.
L. NICET Certified Engineering Technologist (CT) competent in the specific task area.
M. Association of the Wall and Ceiling Industry (AWCI) EIFS Inspector Certification.
N. International Code Council (ICC) Commercial Building Inspector Certification.
O. International Code Council (ICC) Mechanical Inspector Certification.
P. Inspector has passed either the Underwriters Laboratory (UL) Firestop Contractor Program Examination or the Factory Mutual (FM) Firestop Examination.
Q. Pre-stressed Concrete Institute (PCI) Certified Field Auditor
R. Center for Training Transportation Professionals (CTTP) Certified Soil Testing Technician.

Notes:

1. *The Special Inspector shall meet one of the minimum qualifications listed for the applicable Category of Testing and Inspection.*
2. *Materials testing shall be done by an Approved Testing Agency meeting the requirements of the Building Code Section 1703 and ASTM E 32*9.

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SPECIAL INSPECTION REPORT

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:	
DATE OF INSPECTION:	
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC TIME BEGINNING INSPECTION: TIME ENDING INSPECTION:	
DESCRIBE INSPECTIONS MADE, INCLUDING LOCATIONS:	
LIST TESTS MADE:	
LIST ITEMS REQUIRING CORRECTIONS, CORRECTIONS OF PREVIOUSLY LISTED ITEMS AND PREVIOUSLY LISTED UNCORRECTED ITEMS: PROVIDE COPIES OF DISCREPANCY NOTICES:	
COMMENTS:	
TO THE BEST OF MY KNOWLEDGE, WORK INSPECTED WAS IN ACCORDANCE WITH THE APPROVED DESIGN DRAWINGS, AND SPECIFICATIONS, EXCEPT AS NOTED ABOVE.	
PRINTED FULL NAME	
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY	
SIGNED:	DATE:
CERTIFICATION:	NUMBER:

One copy of this report to remain at job site with the contractor for review upon request.

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DISCREPANCY NOTICE No. _____

SPECIAL INSPECTION DISCREPANCY NOTICE

(Completed by Special Inspector)

PROJECT NAME / ADDRESS:		
INSPECTION TYPE(S) COVERAGE ☐ CONTINUOUS ☐ PERIODIC		
AREA INSPECTED	TYPE OF INSPECTION	
APPLICABLE DRAWING SHEET NUMBER(S) AND/OR SPECIFICATION SECTION:		
NOTICE DELIVERED TO: O CONTRACTOR O ENGINEER/ARCHITECT O OWNER	DATE:	TIME:
MAKE THE FOLLOWING CORRECTIONS AND SECURE INSPECTION APPROVAL PRIOR TO PROCEEDING WITH THIS PHASE OF THE WORK.		
PRINTED FULL NAME		
NOTE BY "SPECIAL INSPECTOR" OR PROVIDE NAME OF TESTING AGENCY		
SIGNED:	DATE:	
CERTIFICATION:	NUMBER:	
DATE RE-INSPECTED AND APPROVED AND SIGNATURE OF SPECIAL INSPECTOR:		

One copy of this report to remain at job site with the contractor for review upon request.

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary telecommunications services.

B. Temporary sanitary facilities.

C. Vehicular access and parking.

1.02 RELATED REQUIREMENTS

A. Section 01 51 00 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 51 00

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Telephone Land Lines: One line, minimum; one handset per line.
   2. Internet Connections: Minimum of one; DSL modem or faster.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.06 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.07 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

1.02 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Provide power service required from utility source.

C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

D. Provide main service disconnect and over-current protection at convenient location and meter.

E. Permanent convenience receptacles may be utilized during construction.

F. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations .
   1. Temporary lighting during construction to meet or exceed OSHA Standards - 29 CFR Part 1926.56.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

1.05 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.06 TEMPORARY COOLING

A. Cost of Energy: By Contractor.

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.07 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus; 2014.

B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2014).

C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2011.

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a.

E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.

F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

J. Open Water: Prevent standing water that could become stagnant.

K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
1. Straw or hay.
2. Wood waste, chips, or bark.
3. Erosion control matting or netting.
4. Cutback asphalt.
5. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Gravel Bags: Bags shall be constructed of a pervious, non-biodegradable material. When filled with gravel, bags shall be approximately 24" long by 12" wide by 6" high. Gravel shall be 1/2" to 1" diameter course aggregate.

D. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632.

5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

E. Silt Fence Posts: One of the following, minimum 5 feet long:
1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
2. Softwood, 4 by 4 inches in cross section.
3. Hardwood, 2 by 2 inches in cross section.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
1. Provide linear sediment barriers:
a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
b. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
c. Across the entrances to culverts that receive runoff from disturbed areas.
2. Space sediment barriers with the following maximum slope length upslope from barrier:
a. Slope of Less Than 2 Percent: 100 feet..
b. Slope Between 2 and 5 Percent: 75 feet.
c. Slope Between 5 and 10 Percent: 50 feet.
d. Slope Between 10 and 20 Percent: 25 feet.
e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
2. Gravel bag inlet sediment traps shall be constructed around sump inlets and upstream of on-grade curb inlets using gravel filter bags to impede silt from entering the inlets. Inlet sediment filters shall be constructed in accordance with the details and at the locations shown on the plans or as directed by the Architect-Engineer.

E. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

F. Soil Stockpiles: Protect using one of the following measures:
1. Cover with polyethylene film, secured by placing soil on outer edges.
2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
   1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
   2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.

H. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 6 inches.
   2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
   3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
   7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   8. Fasten fabric to wood posts using one of the following:
      a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
      b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.
   9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
   10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Mulching Over Large Areas:
   1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
   2. Wood Waste: Apply 6 to 9 tons per acre.
   3. Asphalt: Apply at 1200 gallons per acre.
   4. Erosion Control Matting: Comply with manufacturer's instructions.

D. Mulching Over Small and Medium Areas:
   1. Dry Straw and Hay: Apply 4 to 6 inches depth.
   2. Wood Waste: Apply 2 to 3inches depth.
   3. Asphalt: Apply 1/4 gallon per square yard.
   4. Erosion Control Matting: Comply with manufacturer's instructions.

E. Temporary Seeding:
   1. When hydraulic seeder is used, seedbed preparation is not required.
   2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
   3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.

4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect Engineer.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

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SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Sustainable design-related product requirements.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Document 01 60 01 - Substitution Request Form.

B. Document 00 21 13 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

C. Section 01 40 00 - Quality Requirements: Product quality monitoring.

D. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

E. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Notice to Proceed.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.
   2. Containing lead, cadmium, asbestos.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.

D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.

E. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

2.02 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

D. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design. Submit a request for substitution for any product not indicated.

E. Where a definite material is indicated, it is the "basis of design," including aesthetics such as color, pattern, and texture. It is the intent to set a definite standard and shall be included in the contract amount.

2.03 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required. Comply with requirements specified in Section 00 21 13 - Instructions to Bidders.

B. Submit substitution requests by completing the form in Section 01 60 01 - Substitution Request Form. Use only this form; other forms of submission are unacceptable.
   1. Submit one electronic pdf file of request for substitution for consideration. Limit each request to one proposed substitution.

C. Architect Engineer will consider requests for substitutions only within 30 days after date of Agreement.

D. Products indicated in the color and finish schedules or drawing notes; including color, shade, hue, translucence, opacity, pattern, or texture; establish the Basis of Design. Use the Basis of Design. Submit a request for substitution for any product not named.

E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

F. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

5. Agrees to reimburse Owner and Architect Engineer for review or redesign services associated with re-approval by authorities.

G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

H. Substitution Submittal Procedure (after contract award):
1. Submit substitution requests by completing the form in Section 01 60 01 - Substitution Request Form; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.
2. Submit one electronic pdf file copies of request for substitution for consideration. Limit each request to one proposed substitution.
3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Complete data must be submitted for comparison and test when requested by the Architect. Burden of proof is on proposer. Coordinate and submit at the same time all proposed substitutions that affect the design, including aesthetics such as color, pattern, and texture.
4. Architect Engineer will notify Contractor in writing of decision to accept or reject request.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

L. Prevent contact with material that may cause corrosion, discoloration, or staining.

M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

N. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 60 01

SUBSTITUTION REQUEST FORM

TO: CROMWELL ARCHITECTS ENGINEERS (THROUGH THE CONSTRUCTION MANAGER)

ATTENTION: JOHN MIXON, AIA <JMIXON@CROMWELL.COM>

505 Union Street, 2nd Floor, Jonesboro, AR 72401 (870) 336-0536

SECTION PARAGRAPH DESCRIPTION

_____ _____ SPECIFIED ITEM: _____

_____ _____ PROPOSED SUBSTITUTE: _____

Attach complete description, designation, catalog or model number, spec data sheet, and other technical data, including laboratory tests if applicable. In addition to data, include a side-by-side comparison of each element of the specified product and the proposed substitution. The Architect Engineer must be able to clearly and quickly compare all aspects of the two products. Insufficient information for review may be cause for rejection of proposed substitution. Burdon of proof is proposer's responsibility.

Approved substitution will only be issued by Addendum or other official Modification.

FILL IN BLANKS BELOW:

1. Will substitution affect dimensions indicated on drawings?_____
2. Will substitution affect wiring, piping, ductwork, etc., indicated on drawings? _____
   _____
3. Differences between proposed substitution and specified item? _____
4. What affect will substitution have on other trade contractors? _____
5. What affect will substitution have on Project Construction Schedule? _____
6. If necessary, will the undersigned pay for Architect Engineer's cost, required to revise working drawings, caused by substitution? _____
7. Manufacturer's warranties of specified items and proposed items are:
   [ ] Same [ ] Different (explain) _____

SUBMITTED BY:	**REVIEW COMMENTS**
Firm: _____	[ ] Incomplete Information
Address:_____	[ ] Approved
_____	[ ] Approved As Noted
Signature: _____	(see attached copy)
Date: _____	[ ] Not Approved
By:_____ Date:_____	[ ] Received Too Late
Telephone:_____	Remarks: _____
Fax:_____	_____

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SECTION 01 61 16

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 07 92 00 - Joint Sealers: Emissions-compliant sealants.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings.
   2. Interior adhesives and sealants, including flooring adhesives.
   3. Flooring.
   4. Composite wood.
   5. Products making up wall and ceiling assemblies.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings.
   2. Interior adhesives and sealants, including flooring adhesives.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; California Department of Public Health; v1.1, 2010.

D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board; current edition.

E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

F. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.

G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
   1. Wet-Applied Products: State amount applied in mass per surface area.
   2. Paints and Coatings: Test tinted products, not just tinting bases.
   3. Product data submittal showing VOC content is NOT acceptable evidence.
   4. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.

B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.

C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
   2. Inherently Non-Emitting Materials.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instruction of Owner personnel.

H. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

I. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures.

C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

D. Section 01 51 00 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01 57 13 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.

F. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

G. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

H. Section 07 84 00 - Firestopping.

I. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor or Engineer before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor or Engineer, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.
   6. Include in request:
      a. Identification of Project.
      b. Location and description of affected work.
      c. Necessity for cutting or alteration.

d. Description of proposed work and products to be used.
e. Alternatives to cutting and patching.
f. Effect on work of Owner or separate Contractor.
g. Written permission of affected separate Contractor.
h. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

H. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.05 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

H. Use drawing dimension indicated. Do not scale drawings. Request clarifications for uncertainties.

I. Perform no portion of the Work at any time without current Contract Documents, modifications, or, where required, reviewed Shop Drawings, Product Data, or Samples for such portion of the Work. Where necessary for performance of the Work, Contractor shall have available at project site and/or main office the referenced standards, manufacturer's instructions, and laws and regulations of authorities having jurisdiction. Any interpretation, clarification, correction, or change of the Contract Documents shall be made only by a written modification. Interpretations, clarifications, corrections, or changes of the Contract Documents made in any other manner shall not be binding, and the Contractor shall not rely upon such modifications.

J. In the case of an inconsistency between Drawings and Specifications, or within either Document not clarified by a Modification, the better quality and/or greater quantity of Work shall be provided in accordance with the Architect's interpretation. In the case of an inconsistency between these Contract Documents, referenced standards, applicable codes and regulations not clarified by addendum, the most stringent requirements or better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match products and work in place for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 STRUCTURAL WORK

A. Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio. Submit proposal and request and obtain Architect Engineer's approval before proceeding with cut-and-patch of structural work.

3.02 VISUAL/QUALITY LIMITATIONS

A. Do not cut-and-patch work exposed to view, exterior and interior, in a manner resulting in noticeable reduction of visual qualities and similar qualities, as judged by Architect Engineer.

B. Engage the original installer/fabricator or, if not available, an acceptable equivalent entity, to perform cutting and patching.

C. Refinish entire surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection. For an assembly, refinish the entire unit.

3.03 LIMITATION ON APPROVALS

A. Architect Engineer's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as judged by Architect Engineer.

3.04 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.05 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.06 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect Engineer four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect Engineer, Owner, participants, and those affected by decisions made.

3.07 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect Engineer of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on Drawings.

E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

F. Promptly report to Architect Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect Engineer.

H. Utilize recognized engineering survey practices.

I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

K. Periodically verify layouts by same means.

L. Maintain a complete and accurate log of control and survey work as it progresses.

M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.08 GENERAL INSTALLATION REQUIREMENTS

A. Accomplish the Work, including products, equipment, and systems; complete and functional; ready for operation.

B. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

C. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

D. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

E. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

F. Make neat transitions between different surfaces, maintaining texture and appearance.

3.09 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

C. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.

D. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. At in place work (new or existing), minimize damage and restore to original or specified condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.

J. Patching:
1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.10 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.11 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.12 STARTING EQUIPMENT AND SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect Engineer and owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.13 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.14 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

3.15 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.16 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect Engineer and Owner.

B. Notify Architect Engineer when work is considered ready for Architect Engineer's Substantial Completion inspection.

C. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect Engineer's Substantial Completion inspection.

D. Owner will occupy all of the building as specified in Section 01 10 00.

E. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

F. Notify Architect Engineer when work is considered finally complete and ready for Architect Engineer's Substantial Completion final inspection.

G. Complete items of work determined by Architect Engineer listed in executed Certificate of Substantial Completion.

3.17 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect Engineer including Consent of Surety with claim for final Application for Payment. Neither final payment nor any retained percentage shall become due until the Contractor submits to the Architect complete redline Contract Documents for inclusion in the record documents.

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect Engineer will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect Engineer comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

G. Provide servicing and lubrication schedule, and list of lubricants required.

H. Include manufacturer's printed operation and maintenance instructions.

I. Include sequence of operation by controls manufacturer.

J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

K. Provide control diagrams by controls manufacturer as installed.

L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.

M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

O. Include test and balancing reports.

P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect Engineer, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.

3. Operation and Maintenance Data: Arranged by system, then by product category.
   a. Source data.
   b. Product data, shop drawings, and other submittals.
   c. Operation and maintenance data.
   d. Field quality control data.
   e. Photocopies of warranties and bonds.
4. Design Data: To allow for addition of design data furnished by Architect Engineer or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Electrical systems and equipment.
   5. Conveying systems.
   6. Landscape irrigation.
   7. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
   2. Finishes, including flooring, wall finishes, ceiling finishes.
   3. Fixtures and fittings.
   4. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit to Architect Engineer for transmittal to Owner.
   2. Submit to Commissioning Authority for review and inclusion in overall training plan.
   3. Submit not less than four weeks prior to start of training.
   4. Revise and resubmit until acceptable.
   5. Provide an overall schedule showing all training sessions.
   6. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications.
      d. Intended audience, such as job description.
      e. Objectives of training and suggested methods of ensuring adequate training.
      f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
      g. Media to be used, such a slides, hand-outs, etc.
      h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.
   4. Operation and Maintenance manuals to be provided in electronic format with Table of Contents / bookmarks.
   5. Labeling shall be consistent with other project documents.

D. Training Reports:
   1. Identification of each training session, date, time, and duration.
   2. Sign-in sheet showing names and job titles of attendees.
   3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.

E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: DVD Disc.
   2. Label each disc and container with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstration may be combined with Owner personnel training if applicable.

C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.
   2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
   1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 TRAINING - GENERAL

A. Conduct training on-site unless otherwise indicated.

B. Owner will provide classroom and seating at no cost to Contractor.

C. Provide training in minimum two hour segments.

D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time. Once training schedule has been approved by both parties, failure of Owner to present all employees for a scheduled training session provides cause for Contractor to charge Owner for Contractor's personnel lost time.

E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

F. Product- and System-Specific Training:

1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

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SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.03 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 57 13 - Temporary Erosion and Sediment Control.

D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

E. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

F. Section 31 22 00 - Grading: Topsoil removal.

G. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove portions of existing buildings:
   1. To accomplish new work or as indicated.

B. Remove paving and curbs as required to accomplish new work.

C. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade if required.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.

3. Provide, erect, and maintain temporary barriers and security devices.
4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
5. Do not close or obstruct roadways or sidewalks without permission.
6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

D. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

E. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

E. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
1. Verify that construction and utility arrangements are as shown.
2. Report discrepancies to Architect Engineer before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections: Code required special tests and inspections.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 27 31 - Reinforced Unit Masonry: Reinforcement for engineered masonry.

1.04 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

B. ACI SP-66 - ACI Detailing Manual; 2004.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

E. CRSI (DA4) - Manual of Standard Practice; 2009.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, location of splices, and mechanical splices and connections. Show additional reinforcing required to hold reinforcing in place.

C. Plans shall be at 1/8" = 1'-0" or larger scale.

D. Shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings and shop drawings that have not been reviewed by the general contractor will be returned without review by the architect/engineer.

E. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Deformed billet-steel bars.
   2. Unfinished.

B. Deformed Bar Anchors: Deformed Bar Anchors, A496, minimum yield strength 75 KSI

C. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. Mesh Size and Wire Gage: As indicated on drawings.

D. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
3. Provide plastic components for placement within 1-1/2 inches of weathering surfaces.

2.02 RE-BAR SPLICING:

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing 125% of the full steel reinforcing design strength in tension and compression.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is not permitted.

C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

D. Deformed Bar Anchors: The anchors are welded to plates in accordance with Chapter 7 of AWS D1.1, using a stud welding gun. Do not fillet weld deformed bar anchors.

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete beyond the tolerances noted below.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Welded wire fabric shall have lapped splices made so that the overlap measured between the outermost cross wires of each fabric sheet is not less than the spacing of the cross wires plus 2 inches.

D. Do not displace or damage vapor barrier.

E. Accommodate placement of formed openings.

F. Conform to drawings for concrete cover over reinforcement.

G. Placement Tolerances: Bars should be placed to the following tolerances: Concrete cover to formed surface: plus or minus 1/4 inch. Minimum spacing between bars: 1/2 inch. Crosswise of members: plus or minus 2 inches. Lengthwise of members: plus or minus 2 inches. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits , or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to approval by the Architect/Engineer.

H. Grouting of dowels into existing concrete shall be done with cement based non-shrink grout mixed and installed as required by the manufacturer's instructions.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 45 33 - Code-Required Special Inspections, will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Concrete formwork.

B. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Concrete foundations and anchor bolts for pre-engineered building.

E. Concrete footings.

F. Joint devices associated with concrete work.

G. Miscellaneous concrete elements, including equipment pads, light pole bases, thrust blocks, and manholes.

H. Post-installed anchors

I. Concrete curing.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections: Code required special tests and inspections.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 35 43 - Polished Concrete Finishing: Products and installation for polished concrete floor slabs.

D. Section 07 92 00 - Joint Sealers: Products and installation for sealants for saw cut joints and isolation joints in slabs.

E. Section 07 90 05 - Joint Sealers: Sealants for saw cut joints and isolation joints in slabs.

F. Section 09 05 61 - Common Work Results for Flooring Preparation: Remediation of slabs with excessive moisture or pH.

1.04 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

F. ACI 305R - Hot Weather Concreting; 2010.

G. ACI 306R - Cold Weather Concreting; 2010.

H. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.

J. ACI 347R - Guide to Formwork for Concrete; 2014.

K. ACI 355.2 - Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete;American Concrete Institute International; 2007.

L. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2015

M. ASTM C138/C138M - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete; 2014.

N. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2010.

O. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2012.

P. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

Q. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

R. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

S. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

T. ASTM C138/C138M

U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

V. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

X. ASTM C172/C172M

Y. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2014.

Z. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

AA. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

AB. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

AC. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.

AD. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.

AE. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete; 2012.

AF. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

AG. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.

AH. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

AI. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

AJ. ASTM C 1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012

AK. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.

AL. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

AM. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; 1974.

AN. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

AO. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix designs.
   1. Indicate proposed mix designs complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Submit mix design for each concrete mix including test results documenting average compressive strength in accordance with ACI 301. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Include manufacturer's data for admixtures included in the mix. Include suppliers data and tests for aggregates and cementitious materials including portland cement, fly ash, and ground granulated blast-furnace slag as applicable.
      a. Indicate amounts of mixing water to be withheld for later addition at Project site.

D. Samples: Submit samples of underslab vapor retarder to be used.

E. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

G. Concrete delivery ticket: Submit a sample concrete delivery ticket in accordance with the requirements of ANSI/ASTM C94-03a "Standard Specification for Ready-Mix Concrete."

H. Concrete test results: Submit copies of all concrete test results signed by the testing laboratory.

I. Concrete Installers and Finishers Qualifications: Submit documentation for ACI certification for concrete flatwork finishers.

J. Testing Agency Qualifications: Submit qualifications for testing laboratory including certification for field testing technicians and laboratory testing technicians.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain at least one copy of each document on site.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. Testing Agency Qualifications: an independent testing and inspection lab, acceptable to the Architect/Engineer, shall perform specified tests and inspections. The testing lab shall be qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

E. Concrete Installers and Finishers Qualifications: Concrete flatwork shall be performed utilizing high quality techniques conforming to American Concrete Institute Standards in ACI Publication CP-10, Concrete Flatwork Technician and Flatwork Finisher, and ACI Publication CCS-1, Concrete Craftsman Series, Slabs on Grade.

1. All concrete placing and finishing shall be performed by a crew lead by at least one ACI certified Flatwork Finisher or ACI certified Technician.
2. All concrete placing and finishing shall be performed by a crew lead by at least two personnel both of whom are an ACI certified Flatwork Finisher or an ACI certified Technician.

F. Concrete Manufacturer: Furnish concrete from a plant complying with the requirements of ASTM C94, Sections 8 & 9 with a current certificate from the National Ready Mixed Concrete Association.

G. Mix Design Engineer: Licensed to practice engineering in the state where the project is located with a minimum of 3 years experience in preparing concrete mix designs.

H. Cooperate with the Testing Agency and any special inspectors and provide them with free access to the work.

I. The testing agency shall verify the correct concrete mix design is being provided at the ready mix plant prior to going to the job site.

J. For floor slabs, verify concrete admixtures and sealants used are compatible with the applicable designated floor coverings and adhesives.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
1. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT

A. Comply with requirements of Section 03 20 00 - Concrete Reinforcing.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
1. Acquire all cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C 33, Class 3M.
1. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials. Stockpile aggregates in a manner that will prevent segregation or contamination with other materials or other size aggregates. Alkali-Silica Reactive (ASR) aggregates are not allowed.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: Potable, clean and not detrimental to concrete, conforming to ASTM C 1602/C1602M.

2.04 ADMIXTURES

A. Chemical Admixture Manufacturers:
1. Euclid.
2. Sika.
3. WR Grace.
4. BASF Corporation – Admixture Systems.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

C. Air Entrainment Admixture: ASTM C260/C260M.

D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

F. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

G. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

H. Accelerating Admixture: ASTM C494/C494M Type C.

I. Retarding Admixture: ASTM C494/C494M Type B.

J. Water Reducing Admixture: ASTM C494/C494M Type A.

K. Store admixtures to avoid contamination, evaporation, or damage. Protect liquids from freezing or other adverse temperatures. Agitate all admixtures used in form of suspension or non stable solutions prior to use. Follow manufacturer's directions.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Complying with ASTM E1745, Class A; with a water vapor permeance ratings of 0.04 perms or less when tested in accordance with ASTM E 154 and stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
      a. Where void forms are used, use tape which also mechanically bonds the vapor retarder to the bottom of the concrete slab, per the manufacturer's instructions.
   2. Products:
      a. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A): www.insulationsolutions.com.
      b. Stego Industries, LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
      c. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com.
      d. VoidForm Products, Inc.; SureWrap 15 mil: www.voidform.com
      e. Raven Industries; VaporBlock VB15: www.vaporblock.com
      f. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. ASTM C1107/C1107M; Grade A, B, or C.
   2. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
   3. Flowable Products:
      a. Five Star Products, Inc; Five Star Fluid Grout 100: www.fivestarproducts.com.
      b. US MIX Co.; US Spec MP Grout: www.usspec.com .
      c. BASF Corporation - Construction Systems; MasterFlow 928: www.buildingsystems.basf.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   4. Low-Slump, Dry Pack Products:
      a. Five Star Products, Inc; Five Star Grout: www.fivestarproducts.com.
      b. US MIX Co.; US Spec MP Grout: www.usspec.com .
      c. BASF Corporation - Construction Systems; MasterFlow 100: www.buildingsystems.basf.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Capillary Water Barrier/Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2 inch sieve and 0 to 5 percent passing a No. 8 sieve.

D. Post-Installed Anchors
   1. Mechanical Anchors: Tested and qualified for use in accordance with ACI 355.2 and ICC-ES AC193 for cracked and uncracked concrete recognition. Acceptable products include:
      a. SIMPSON STRONG-TIE "TITEN-HD" and "TITEN HD ROD HANGER" (ICC-ES ESR-2713)
      b. SIMPSON STRONG-TIE "STRONG-BOLT 2" (ICC-ES ESR-3037)
      c. HILTI "KWIK HUS-EZ" and "KWIK HUS-EZ I" SCREW ANCHOR (ICC-ES ESR-3027)
      d. HILTI "KWIK BOLT-TZ" EXPANSION ANCHOR (ICC-ES ESR 1917)
      e. HILTI "HDA UNDERCUT" (ICC-ES ESR-1546)
      f. HILTI "HSL-3" EXPANSION ANCHOR (ICC-ES ESR-1545)
      g. POWERS "POWER-STUD+ SD1" (ICC-ES ESR-2818)
      h. POWERS "POWER-STUD+ SD2" (ICC-ES ESR-2502)
      i. POWERS "WEDGE-BOLT+" (ICC-ES ESR-2526)
   2. Adhesive Anchors: Tested and qualified for use in accordance with ICC-ES AC308 for cracked and uncracked concrete recognition. Acceptable products include:
      a. SIMPSON STRONG-TIE "SET-XP" (ICC-ES ESR-2508)
      b. HILTI "HIT-HY 200 SAFESET FAST CURE" (ICC-ES ESR-3187)
      c. HILTI "HIT-RE 500-SD SLOW CURE" (ICC-ES ESR-2322)
      d. POWERS "PE1000+" (ICC-ES ESR-2583)
      e. POWERS "PURE 100+" (ICC-ES ESR-3298)
      f. Steel anchor element shall be Hilti HAS-E, ASTM F1554 Grade 36, or ASTM A193, Grade B6, B8, or B8M continuously threaded rod.
   3. Substitution requests for products other than those specified shall be submitted by the Contractor to the Architect Engineer along with calculations that are prepared and sealed by a registered professional engineer licensed in the State in which the project is located. The calculations shall demonstrate that the substituted product is capable of achieving the pertinent equivalent performance values (minimum) of the specified product using the appropriate design procedures and/or standard(s) as required by the building code.

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

C. Waterstops: PVC, complying with COE CRD-C 572.
   1. Configuration: As indicated on the drawings.
   2. Products:
      a. VINYLEX Corporation; RB-316: www.vinylex.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.
   1. Configuration: As indicated on drawings.Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, with a minimum cross-section of 3/4 inch by 3/4 inch at concrete elements with a minimum dimension 8 inches and greater and 3/4 inch by 3/8 inch at concrete elements with a minimum dimension of less than 8 inches.
   2. Products:
      a. Volclay Waterstop-RX by Colloid Environmental Technologies Company
      b. Conseal CS-231 by Concrete Sealants Inc
      c. Swellstop by Greenstreak
      d. Hydro-Flex by Henry Company

e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
1. Size: As indicated on drawings.

F. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
1. Material: ASTM D1751, cellulose fiber.

G. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.
1. Products:
a. W.R. Meadows, Inc; Speed-E-Joint: www.wrmeadows.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.
1. Provide removable or non-removable plastic cap based on slab exposure, floor finish and manufacturer's recommendations. Removable plastic caps shall form a minimum 3/8" wide bd 1/2" deep void for sealant.
2. Height: To suit slab thickness.

I. Sealant and Primer: As specified in Section 07 90 05 - Joint Sealers.

J. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95, according to ASTM D 2240.

2.07 CURING MATERIALS

A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
1. Application: Use at floors scheduled to receive thin finish system, polish, or stain when approved by both the Architect/Engineer and the floor finisher.
2. Product dissipates within 4 to 6 weeks.
3. Verify compatibility with final finish.

B. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
1. Application: Use at concrete slabs exposed in final construction but not scheduled to receive polishing or stain and not subject to wheel traffic such as forklifts or pallet jacks.
2. A minimum of 2 coats are required. The first coat for curing and the second coat for sealing after all construction debris is removed.
3. Vehicle: Water-based.
4. Solids by Mass: 25 percent, minimum.
5. VOC Content: OTC compliant.

C. Penetrating Liquid floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces. Acceptable products include:
1. Conspec Marketing & Manufacturing Co; Intraseal
2. Curecrete Distribution Inc.; Ashford Formula
3. Euclid Chemical Company; Euco Diamond Hard
4. L&M Construction Chemicals, Inc.; Seal Hard
5. Meadows, W.R., Inc.; Liqui-Hard
6. Nox-Crete Products Group, Kinsman Corporation; Duranox
7. US Mix Products Company; Industraseal
8. BASF Corporation - Construction Systems; MasterKure HD 200 WB

D. Moisture-Retaining Sheet: ASTM C171.

1. Regular curing paper, white curing paper, clear polyethylene, white polyethylene, or white burlap-polyethylene sheet.

E. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect Engineer for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

D. For floor slabs, verify components of mix design are compatible with the flooring materials and adhesives.

E. Normal Weight Concrete:
   1. Water-Cement Ratio: As indicated in Concrete Mixture Schedule.
   2. Air Content, when determined in accordance with ASTM C231: As indicated in Concrete Mixture Schedule for mixes where Air-entrainment is required.
   3. Maximum Slump: As indicated in Concrete Mixture Schedule before the addition of any water reducing admixture, but no more than 8 inches after the addition of any water reducing admixture. Higher slumps may be acceptable in self consolidating concrete or flowing concrete applications with the approval of the Architect Engineer.
   4. Maximum Aggregate Size: As indicated in Concrete Mixture Schedule.
   5. Fly Ash Content: Fly Ash shall not be used in concrete for slabs. Maximum 25 percent of cementitious materials by weight for other concrete.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Mixing Time: Mix and place concrete within 1 1/2 hours of initial batching of the concrete. When the air temperature is between 85 and 90 degrees F reduce the maximum time between batching and placing the concrete to 75 minutes. When the air temperature is above 90 degrees F reduce the batching and placing time to 60 minutes. Longer mix times may be possible with the use of appropriate admixtures but only with written approval of admixture manufacturer(s) and Architect/Engineer.

C. Addition of Water at Job Site: Unless the delivery ticket states the amount of water that can be added without exceeding the design water cement ratio and the slump of the mix, water cannot be added at the job site. Addition of water above the design water/cement ratio shall be cause for rejection of the concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.

B. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete. Chamfer exterior corners and edges of permanently exposed concrete. Comply with Division 1 requirements for certified wood used for formwork and disposal of construction waste.

C. Verify that forms are clean and free of rust before applying release agent.
   1. Where as-cast finishes are required do not use materials on the face of the form that will impart a stain to the concrete. Where the finished surface is required to be coated, the

material applied to the form surfaces shall be compatible with the type of coating to be used.

D. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
   2. Use latex bonding agent only for non-load-bearing applications.

F. Interior Slabs: Install vapor retarder under interior slabs per ASTM E 1643 and the manufacturer's written instructions. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Use manufacturer's recommended pipe boot and tape to seal vapor retarder to all pipes, conduits, and other elements that penetrate slabs-on-grade. Repair damaged vapor retarder before covering per manufacturer's instructions.
   1. Extend vapor retarder over footings and seal to foundation wall, grade beam, or slab at an elevation consistent with the top of the slab or terminate at impediments such as water stops or dowels. Seal around penetrations such as utilities and columns in order to create a monolithic membrane between the surface of the slab and moisture sources below the slab as well as at the slab perimeter.
   2. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.

3.03 PLACING CONCRETE

A. Do not add water to concrete during delivery at Project site unless amount that can be added without exceeding the water/cement ratio is stated on the delivery ticket. If water is allowed to be added it must be introduced and mixed inside the transit mixer drum for 5 minutes or 70 revolutions before the concrete leaves the truck.

B. Place concrete in accordance with ACI 304R.
   1. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. Do not use vibrators to transport concrete inside of forms.

C. Place concrete for floor slabs in accordance with ACI 302.1R.
   1. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel of section is complete. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

D. Notify Architect Engineer not less than 24 hours prior to commencement of placement operations.

E. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

F. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

G. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

H. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

I. Cold Weather: When the temperature is below 40 degrees F maintain concrete temperature between 50 and 70 degrees F for the required curing period. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Do not use calcium chloride, salt, or other materials containing antifreeze agents. Do not use chemical accelerators unless approved by the Architect/Engineer and included in the mix designs. Follow recommendations of ACI 306R.

J. Hot Weather: When the temperature is over 85 degrees F, maintain the concrete below 90 degrees F at the time of placement. Make arrangements for installation of windbreaks, shading, fog spraying, sprinkling, ponding, or other protective measures to protect the concrete. Fog spray forms, steel reinforcement, and subgrade just before placing concrete. Keep the subgrade uniformly moist without standing water, soft spots, or dry areas. Follow recommendations of ACI 305R.

3.04 SLAB JOINTING

A. Locate joints as indicated on the drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
   1. Form weakened-plane contraction joints in layout indicated. Provide keyed joints at construction joints and where indicated. Other joints may be keyed joints or sawn joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
   1. Saw joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints in concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant. Install per manufacturer's recommendations.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect finished slabs for conformance to specified tolerances.

B. Maximum Variation of Surface Flatness:
   1. Exposed Concrete Floors: 1/4 inch in 10 feet.
   2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
   3. Under Carpeting: 1/4 inch in 10 feet.

C. At floor slabs scheduled to receive polished concrete finish, verify flatness and levelness of concrete slabs meet or exceed Specified Overall Values (SOV) of flatness, F(F) 50 and of levelness, F(L) 35; with Minimum Local Values (MLV) of flatness, F(F) 30; and of levelness, F(L) 20.

D. Correct the slab surface if tolerances are less than specified.

E. Correct defects by grinding or by removal and replacement of the defective work as directed by the Architect/Engineer. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 JOINTS - OTHER THAN SLABS

A. General: Construction joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect/Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated or at 20 foot maximum on center if not indicated.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.07 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints where indicated to form a continuous diaphragm. Install in longest lengths practical. Support and protect waterstops during progress of the work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practical.

3.08 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and terrazzo with full bed setting system.
   2. Surfaces to Receive Thin Floor Coverings: "Light steel-troweled" as described in ACI 301.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   3. Decorative Exposed Surfaces: "Normal steel-troweled" as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to be polished, and all other slab surfaces.
      a. Steel-Reinforced Plastic Trowel Blade Manufacturer: Wagman Metal Products, Inc: www.wagmanmetal.com.
   4. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

E. In areas with floor drains, unless noted otherwise, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings.

3.09 CURING AND PROTECTION

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Slabs scheduled to receive Adhesive-Applied Flooring or other moisture sensitive flooring: Slab shall be cured by being covered with moisture retaining sheets (curing paper, polyethylene, or a combination of the two) for 3 to 7 days. Slabs shall not be cured by adding water. Curing compounds are not allowed.
   1. Floor slabs shall meet the requirements of Section 090561 prior to installation of floor coverings.

E. Slabs scheduled to receive polish, stain, or thin finish systems and other Surfaces Not in Contact with Forms:
   1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
      a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
      b. Spraying: Spray water over floor slab areas and maintain wet.
      c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
   2. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.

F. Slabs on grade exposed in final construction, not subject to wheel traffic (such as forklifts or pallet jacks) and not scheduled to receive stain or polish: Curing shall be by a curing and sealing compound.
   1. Curing and sealing compound: Apply uniformly to floors and slabs in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during the curing period. Clean the top of the slab and provide a final coat to seal the slab before the final acceptance by the owner.

G. Slabs on grade exposed in final construction and subject to wheel traffic (such as forklifts or pallet jacks): The floor shall be sealed with a penetrating liquid floor treatment. Curing shall be accomplished by damp curing, sheet curing, or a dissipating curing compound compatible recommended by the penetrating liquid floor treatment. Preparation of the slab and application of the penetrating liquid floor treatment shall be per the manufacturer's instructions.

H. Protection of work: Protect all work from damage from concreting operations. Protect completed concrete as follows:
   1. Finished Surfaces: Protect from damage from rain. Keep surfaces clean and free from oil, grease, dirt, or other foreign matter and protect from damage by construction equipment, materials, etc. Do not permit heavy traffic on finished floor for a minimum of 7 days after it is placed. Install barriers and if necessary maintain a watchman to enforce this requirement. Do not cut pipe on slabs to be exposed in final construction. Diaper all equipment working over slabs to receive stain to prevent oil leakage.
   2. Protection of Footings Against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

3.10 REMOVAL AND REUSING FORMS

A. Removal of forms:
   1. Formwork not supporting the weight of the concrete, such as sides of beams, walls, column, and other similar part of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete provided the concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

2. Formwork supporting the weight of the concrete, such as beam, soffits, and slabs, may not be removed in less than 14 days after the concrete is placed and until concrete has attained 80 percent of its minimum compressive strength at 28 days.

B. Reusing forms:
   1. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form release agent.
   2. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Architect/Engineer.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as here-in specified, to blend with in-place construction.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.

C. Equipment Bases And Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnished machines and equipment.

D. Steel Column Base Plates: Grout base plates and foundations as indicated on drawings using specified non-metallic non-shrink grout.

E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces with light broom finish.

F. Reinforced Masonry: Provided concrete grout for reinforced masonry lintels and bond beams where indicated on drawings. Maintain accurate location of reinforcing steel during concrete placement.

G. Post-installed anchors:
   1. Shall only be used where specified on the construction documents. The contractor shall obtain approval from the Architect/Engineer prior to installing post-installed anchors in place of missing or misplaced cast-in-place anchors.
   2. Care shall be taken in placing post-installed anchors to avoid conflicts with existing rebar.
   3. Hole shall be drilled and cleaned in accordance with the manufacturer's written instructions.
   4. Provide continuous or periodic inspection for all adhesive and mechanical anchors per the product's applicable ICC-ES Evaluation Report (ICC-ES ESR).
   5. Contact manufacturer's representative for the initial training for installation of and for product related questions and availability. Call SIMPSON STRONG-TIE at (800) 999-5099. Call HILTI at (800) 423-6587. Call POWERS at (800) 423-6587.
   6. The contractor shall arrange an anchor manufacturer's representative to provide on-site installation training for all of their anchoring products specified.The Architect Engineer must receive documented confirmation that all of the contractor's personnel who install anchors are trained prior to the commencement of installing anchors.

3.12 JOINT FILLER

A. Slab on Grade Control Joint Filler: At keyed construction joints, sawn joints, and tooled joints fill the control joint as follows:
   1. Slabs exposed to view in final construction: Remove the cap at keyed control joints, clean the joint and fill the void with semi-rigid joint filler. Install in accordance with manufacturer's written instructions.

2. Slabs to be covered with tile: Remove the cap at keyed control joints, clean the joint, and fill the joint and any spalls or other slab imperfections with non-shrink grout or a concrete patching material a minimum of 56 days after the slab has been poured.
3. Slabs to be covered with carpet: Leave the cap at keyed control joints. Do not fill the joint except where the joint is greater than 1/8" in width and as required to fill spalls and other imperfections in the slab that may damage or show through the carpet. Clean the spall and joint in those areas and fill with non-shrink grout or a concrete patching material.

3.13 FIELD QUALITY CONTROL

A. An independent testing agency shall perform field quality control tests, as specified in Section 01 45 33 - Special Inspections.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. The testing agency shall verify the correct concrete mix design is being provided at the ready mix plant prior to going to the job site.

E. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

F. Concrete Test Samples: Samples for acceptance tests on concrete shall be obtained in accordance with ASTM C172C172M.

G. Compressive Strength Tests: ASTM C39/C39M.
   1. Make and cure test specimen in accordance with ASTM C31/C31M.
   2. Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 150 cu yd of concrete, nor less than once for each 5000 sq ft of surface area for slabs or walls
   3. A strength test shall be the average of the strengths of at least two 6 by 12 in. cylinders or at least three 4 by 8 in. cylinders made from the same sample of concrete and tested at 7 and 28 days. Test additional cylinders at 56 days if the average 28 day strength is less than the specified design strength.
   4. Take one additional test cylinder set during cold weather concreting, cured on job site under same conditions as concrete it represents.

H. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

I. Perform one air contest test in accordance with ASTM C231C231M for each strength test of concrete.

J. Determine temperature of concrete sample for each strength test in accordance with ASTM C1064/C1064M.

K. Determine density (unit weight) and yield of concrete sample for each strength test in accordance with ASTM C138/C138M.

3.14 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect Engineer and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect Engineer for each individual area.

E. Repair of Formed Surfaces: Surface defects include color and texture irregularities, crack, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Cut out honeycombs, rock

pockets, and voids more than 1/2 inch in any dimension in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush coat holes and voids with bonding agent. Fill and compact with patching mortar before the bonding agent has dried. Remove and replace concrete defective surfaces if defects cannot be repaired to satisfaction of Architect/Engineer.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surfaced plan to tolerances specified for each surface and finish. Correct high areas by grinding after concrete has cured at least 14 days. Correct low areas immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete.

3.15 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

3.16 CONCRETE MIXTURE SCHEDULE

A. Use: Footings
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 3000
   2. Aggregate Size Maximum, inches (Note: 1): 1-1/2
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.48
   5. Air Content, percent: None

B. Use: Interior Slab-on-Grade
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 3500
   2. Aggregate Size Maximum, inches (Note: 1): 1
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.48
   5. Air Content, percent: None

C. Use: Floor Slab on Steel Deck
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 3500
   2. Aggregate Size Maximum, inches (Note: 1): 1/2
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.48
   5. Air Content, percent: None

D. Use: Exterior Slabs and Pads
   1. Compressive Strength (fc) Minimum at 28 Days, PSI: 3000
   2. Aggregate Size Maximum, inches (Note: 1): 1
   3. Slump Limit, inches: 4
   4. Water to Cement (w/c) Ratio Maximum: 0.40
   5. Air Content, percent: 6
   6. Floor/Slab Finish: Broom finish

E. Notes:
   1. Maximum size of coarse aggregates: Comply with ACI 301 for minimum clearance between reinforcing bars, sides of forms, and slab or topping thickness (except in unbonded topping maximum aggregate size shall not exceed one-quarter topping thickness).
   2. Air Content, when determined in accordance with ASTM C231: As indicated in Concrete Mixture Schedule for mixes where Air-entrainment is required.
   3. Maximum Slump: As indicated in Concrete Mixture Schedule before the addition of any water reducing admixture, but no more than 8 inches after the addition of any water reducing admixture. Higher slumps may be acceptable in self consolidating concrete or flowing concrete applications with the approval of the Architect Engineer.

END OF SECTION

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SECTION 03 35 43
POLISHED CONCRETE FINISHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. General:
   1. Work in this Section applies to the mechanical polishing of interior concrete floor surfaces. Verify flatness and levelness of concrete slabs meet or exceed Specified Overall Values (SOV) of flatness, F(F) 50 and of levelness, F(L) 35; with Minimum Local Values (MLV) of flatness, F(F) 30; and of levelness, F(L) 20. Do not proceed until unsatisfactory conditions are corrected. Floor grinding and polishing shall be started using a metal disc, as needed to remove all low spots and trowel marks. No low spots or trowel marks are to be left in the slab. A concrete grinding machine with planetary or counter-rotating heads must be used.

B. Section Includes:
   1. Concrete Floor Polishing System including:
      a. Surface preparation.
      b. Densifying agent.
      c. Polished concrete floor finish for Interior use.
      d. Solvent-based Polished Concrete Dye floor finish for Interior use.
      e. Polishing System.
      f. Stain Protection.
      g. Joint filler.

C. Related Sections:
   1. Division 03 Section Cast-In-Place Concrete for concrete floor slab formwork, reinforcement, concrete materials, mixture design, placement procedures, flatness and levelness, and trowel finishes.

1.03 REFERENCE STANDARDS

A. ASTM 4039 Standard Test Method of Reflection Haze of High-Gloss Surfaces

B. ASTM D5767 Standard Test Method for Instrumental Measurement of Distinctness of Image Gloss of Coating Surfaces

C. ACI 310 Guide to Decorative Concrete

D. ASTM D2047 Standard Test for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine

E. ANSI B101.1 Floor Safety Standard

F. ANSI B101.3 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials

G. ASTM D523 Standard Test Method for Specular Gloss

1.04 SUBMITTALS

A. Product Data:
   1. For each type of product and system indicated.
      a. Submit manufacturer's polishing system specifications.
      b. Submit products to be provided, giving manufacturer's name and product name for the specified materials proposed to be provided under this Section.
      c. Submit manufacturer's recommended installation procedures; which when approved by the Architect Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.
         1) Include proposed grinding equipment, vacuum systems, and diamond tooling for approval.

d. Submit technical data sheet giving descriptive data, curing time, and application requirements.
e. Submit recommended maintenance and repair instructions for the installed floor system.

B. Installer Qualification Data:
1. Submit Installer qualifications, references, and certifications as indicated.

1.05 EXTRA STOCK

A. Repair Materials:
1. Furnish 5 gallons of the stain blocker and repair instructions to the technical inspector for future repair by the Owner. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.06 QUALITY ASSURANCE

A. Regulatory Requirements
1. Accessibility Requirements: Comply with applicable requirements of the Americans with Disabilities Act Accessibilty Guidelines (ADAAGs) for Building Facilities; Final Guidelines, revisions, and updates for static coefficient of friction for walkway surfaces.
2. Environmental Requirements: Comply with current Federal and local toxicity and air quality regulations and with Federal requirements on content of lead, mercury, and other heavy metals. Do not use solvents in floor polish products that contribute to air polution.

B. Manufacturer Qualifications:
1. A firm with a minimum of 5 years experience in manufacturing concrete floor polishing product systems.
2. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

C. Installer Qualifications:
1. A firm that is regularly engaged in the installation of polished concrete floor system with a minimum of 3 years experience with proposed system. Furnish documentation of successful completion of a minimum of five projects with proposed system on projects of similar magnitude and complexity. The installer shall have been certified in writing by the special concrete floor finish manufacturer within 12 months prior to start of this project, certifying that the installer is:
a. Current on the latest application means and methods of special concrete floor finish.
b. Eligible to receive manufacturer’s special warranty.
2. The special concrete finish manufacturer shall certify, in writing, that the installer designated for this project is qualified for the scope of this project and has qualified personnel to perform the work.

D. Source Limitations:
1. Obtain each type of material for Special Concrete Floor Finish System from one source approved by Special Concrete Floor Finish System manufacturer with resources to provide materials of consistent quality in appearance and physical properties.

E. Mockups:
1. Provide benchmark sample of Special Concrete Floor Finish System to verify finish indicated and to demonstrate aesthetic effects and set quality standards for materials and execution, i.e., typical joints, surface finish, color variation (if any), and standard of workmanship.
a. Provide mock-up of approximately 250 square feet at location directed by the Architect Engineer.
b. Notify Architect Engineer and special concrete floor finish manufacturer seven days in advance of date and time when mock-up will be constructed.

c. Measure the slip resistance of mock-up and obtain approval of the Architect Engineer and Owner before starting application of special concrete floor finish. Mockup finish shall be finished to Level 3.
d. Measure the finish level of mock-up and obtain approval of the Architect Engineer and Owner before starting application of special concrete floor finish.
If the mock-up does not meet requirements and/or is not approved by the Architect Engineer and Owner, re-polish floor sample until mock-up is approved.
e. Maintain mock-up during construction in an undisturbed condition as a standard for judging the completed work.
f. Approved mock-up may become part of the completed work if undisturbed at time of substantial completion.
g. Apply benchmark sample after permanent lighting and other environmental services have been activated.

F. Pre-Pour and Preinstallation Conferences:
1. The Installer shall participate telephonically before the placement of the concrete slab related to this Section with the General Contractor, and technical inspector to review requirements necessary for a successful polished floor surface.
2. The Installer shall conduct a conference at the Project site to comply with requirements in Division 01 Section Administrative Requirements.
a. Include Architect Engineer, Contractor, Installer, Concrete Subcontractor, and Special Concrete Floor Finish System Manufacturer's representative to establish guidelines and expectations for finished concrete work including floor flatness, levelness, and finished appearance of troweled floor slab.
b. Unacceptable finishes include blisters, ghosting, cracking, crazing, curling, delamination, surface discoloration, dusting, efflorescence, popouts, scaling, and spalling.
c. Review methods and procedures related to the Special Concrete Floor Finish System including, but not limited to, the following protection precautions:
1) No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete floor surface. Prevention is therefore essential.
2) Diaper hydraulic powered equipment to avoid staining concrete.
3) Do not park vehicles on concrete floor slab. Place drop cloths under vehicles if it is necessary to park vehicles on concrete slab to complete work.
4) Do not use pipe cutting machines on the concrete floor slab.
5) To avoid rust staining do not place steel on concrete floor slab.
6) Do not allow acids and acidic detergents to come into contact with concrete floor slab.
7) Inform all trades that the concrete floor slab must be protected at all times.
8) Equip lifts with non-marking tires.
9) Do not use poly sheeting PVC or plastic protection sheets as cover or protection of finished floor.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.08 PROJECT CONDITIONS

A. General:
1. Close spaces to traffic during Special Concrete Floor Finish System application.

B. Environmental Limitations:
1. Comply with Special Concrete Floor Finish System manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting Special Concrete Floor Finish System application.

C. Grinding Operations:

1. Planetary or counter rotating 3 head and 4 head variable speed floor grinder. Minimum size of grinding head shall be 32-inch diameter. Tilt-back machines shall be used for grinding and polishing operations.
2. Dust extraction system for above grinders incorporating HEPA filters.
3. Protect adjacent construction from detrimental effects of grinding operations.
4. Hand or edge grinders with dust extraction or dust suppression attachment.
5. Grinding heads must include both metal bonded diamonds and resin bonded diamonds using a flexible head system.
6. High speed burnisher with minimum 2500 RMN and minimum 20-inch diameter head.
7. Diamond impregnated burnishing pads.
8. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.
9. All grinding diamonds used shall be approved by concrete polishing system manufacturer.

1.09 WARRANTY

A. Special Warranty:
   1. Manufacturer's standard form in which manufacturer agrees to repair or replace Special Concrete Floor Finish System that fails in materials or workmanship within specified warranty period.
      a. Special warranty includes penetrating liquid concrete floor densifying agent, joint filler, finish, and other components of Special Concrete Floor Finish System.
      b. Warranty Period: 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's products and system are named and accompanied by the words "basis of design," including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

2.02 SPECIAL CONCRETE FLOOR FINISH SYSTEM

A. Solvent-Based Polished Concrete Dye:
   1. Environmentally friendly dye formulated using extremely fine molecules of color designed to penetrate concrete floor slab and provide a translucent color enhancement of the concrete surface in conjunction with densified and polished concrete.
      a. Basis-of-Design Products: AmeriPolish Solvent-Based Dye as distributed by Retroplate System (773) 622-2444 and www.retroplatesystem.com.
      b. Color: To Be Selected by Architect Engineer.

B. Penetrating Liquid Floor Densifying Agent:
   1. Clear, chemically reactive, waterborne solution of inorganic materials, catalyzed sodium silicate, and proprietary components; odorless and colorless; that penetrates, hardens, and densifies concrete surfaces. Do not use siliconates, meta silicate, siloxane or inorganic siloxane, magnesium fluorosilicates.
      a. Basis-of-Design Products:
         1) Advanced Floor Products, Inc.; Retro-Plate 99; (773) 622-2444 and www.retroplatesystem.com <http://www.retroplatesystem.com>.

C. Concrete Polishing System:
   1. Patented process of metal bond diamond grinding and polishing in graduated grits from coarse to fine.
   2. Basis-of-Design Systems:
      a. Advanced Floor Products, Inc.; Retro-Plate Concrete Polishing System; (773) 622-2444 and www.retroplatesystem.com <http://www.retroplatesystem.com>.
      b. Aggregate Exposure:

1) Class B: Mottled salt and pepper aggregate exposure. Approximate Surface Cut Depth 1/16".

c. Finish Definition
1) Level 3: Semi-Polished
(a) Reflective Sheen with a Gloss Meter Reading of 50 or better
(b) Reflective Clarity with a DOI of 40 or better

d. Level of Finish shall be Measured for Verification and Approved by the Architect Engineer and Owner prior to the Application of Stain Protection.

3. The Basis-of-Design Special Concrete Floor Finish System manufacturer shall comply to the following performance criteria:
a. General:
1) Coefficient of Friction: All levels of finish exceed OSHA and ADA recommendations per ASTM C 1028.

2.03 STAIN REPELLENT

A. Penetrating Stain Repellent:
1. Non-film forming, water-based, penetrating stain repellent specifically formulated for the protection of polished concrete from oil and water-based stains.
2. Basis-of-Design Products:
a. Advanced Floor Products, Inc.; RetroGuard; (773) 622-2444 and www.retroplatesystem.com <http://www.retroplatesystem.com>.

2.04 JOINT FILLER

A. Semi-Rigid Polyurea Joint Filler:
1. Rapid setting, 100 percent solids, flexible, two part polyurea joint filler with a Type A Shore durometer hardness of at least 65 per ASTM D 2240 when cured. Designed to fill and protect joints in industrial floors that are subject to traffic such as trucks, forklifts or steel wheeled carts.
2. Color: Custom color to match dyed polished concrete.
3. Basis-of-Design Product: Advanced Floor Products, Inc.; Crete-Fill Pro 65; (773) 622-2444 and www.retroplatesystem.com.
4. Performance Criteria:
a. Tensile Strength: 740 psi minimum per ASTM D 412-98.
b. Sets rapidly and consistently in application temperatures ranging from minus 20 deg F to 130 deg F.
c. Elongation: 420 percent minimum.
d. Hardness: 65 (Shore A) per ASTM D 2240-02.

PART 3 EXECUTION

3.01 GENERAL

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance.

B. Verify concrete floor slab has cured a minimum of 45 days or as directed by the manufacturer before beginning application of system.

C. Apply Special Concrete Floor Finish System at least 10 days prior to installation of equipment; provide a complete, uninhibited concrete slab for application.

D. Close areas to traffic during floor application and for amount of time recommended by manufacturer after application.

3.02 SURFACE CONDITIONS

A. Examine substrate, with special floor finish installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

1. Verify flatness and levelness of concrete slabs meet or exceed Specified Overall Values and levels recommended by manufacturer. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that concrete floor slab meet finish and surface profile requirements in Division 03 Section Cast-In-Place Concrete.

C. Prior to application, verify that floor surfaces are free of construction laitance.

3.03 APPLICATION GENERAL

A. General:
1. Start floor finish applications in presence of manufacturer's representative.
2. Densifying and polishing of concrete surface.
a. Only a certified applicator shall apply the penetrating liquid densifying agent. Applicable procedures shall be followed as recommended by the product manufacturer and as required to match approved benchmark sample.
b. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
c. Polish to required sheen level.
d. Measure and verify Finish Level and obtain approval from Architect Engineer and Owner prior to application of stain protection.

3.04 POLISHING SYSTEM

A. Repair and fill all cracks.

B. Thoroughly clean the floor surface as required by manufacturer's instructions.

C. Start the process with the appropriate metal diamond grinding head (for example: 40, 80, 120 grit) depending on condition of concrete floor slab. Continue with additional grinding steps as necessary to achieve a consistent and uniform salt and pepper concrete slab appearance (showing sand aggregate only) and void of random scratches. All metal bond grinding shall be performed wet.

D. Install penetrating densifier at a rate of 200 square feet per gallon, scrubbing product into floor and allowing product to soak until turning slick, leaving the product on floor for a minimum of 60 minutes. Remove excess material using water to neutralize product and dispose of IAW environmental regulations.

E. Begin the polishing process with a 100 grit resin bonded diamond grinding head followed in succession with a 200, 400, 800, and finally a 1500 grit resin bonded diamond grinding head as necessary, to achieve specified sheen. Complete final polishing prior to installation of refrigerated display cases and gondolas shelving.

F. Progressive edge grinding will be necessary within 1/2" of all vertical abutments, including walls, columns, posts, etc.

G. Use hand grinders and burnishers along edges and other areas of floor slab, exposed to view, that are not reachable using a planetary floor grinder.

3.05 APPLICATION OF SOLVENT-BASED DYE

A. Concrete surfaces shall be dry and properly prepared as described above. Protect surrounding areas from over-spray, run-off and tracking. Divide surfaces into small work sections using wall, joint lines, or other stationary breaks as natural stopping points.

B. Apply initial solvent-based dye application at the coverage rate recommended by the manufacturer and use application equipment described in the manufacturer's printed technical literature, but in no case less than the following:
1. Solvent-based dye applied at maximum coverage rate of 400 SF per gallon, with 4 ounces of penetrating additive per gallon of dye.
2. Dye and penetrating additive shall be mixed a minimum of three hours prior to application on floor.

C. The standard application timing for the first application is following the completion of the 400 grit resin diamonds. Apply the solvent-based dye to the substrate with the Patriot SpraySafe System utilizing the gray #8 conical tip.

D. Drying time depends on concrete porosity, wind conditions, temperature, and humidity levels.

E. Apply second application to produce a more consistent appearance. Apply after the first application has dried sufficiently (normally 20 – 50 minutes after application depending on temperature and humidity).

F. The color of the liquid solvent-based dye is not necessarily indicative of the final color produced on the concrete substrate as the dye is translucent and final color achieved will be influenced by the color of the concrete floor slab onto which the dye is applied.

3.06 STAIN PROTECTION

A. Preparation:
   1. Complete all densification, grinding, and polishing before application of stain repellent.
   2. Clean substrate of substances that might interfere with penetration or performance of stain repellent. Check surface for water, according to stain repellent manufacturer's written instructions, to ensure that surface is totally dry.
   3. Install per manufacturer requirements.
      a. Remove oil, laitance, and other substances that could prevent adhesion or penetration of stain repellent.
   4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Application:
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of stain repellent and to instruct Applicator on the product and application method to be used. Comply with manufacturer's written application instructions.
      a. Apply two light "film" coats with application devices recommended by manufacturer’s field representative. Apply second coating, repeating first application. Burnish floor between applications. Comply with manufacturer's written instructions for limitations on drying time between coats.

3.07 JOINT FILLING

A. General:
   1. Prepare, clean, and install joint filler according to manufacturers written instructions and the following requirements.
      a. Defer joint filling until after concrete floor polishing and application of stain protection are completed. Do not fill joints until construction traffic has permanently ceased in areas receiving joint filler.
      b. Remove all foreign material from joint substrates that could interfere with adhesion of joint filler, including dust, paints (except for permanent, protective coatings tested and approved for filler adhesion and compatibility by joint filler manufacturer), old joint sealants and fillers, grease, dirt, debris, and saw cuttings; leave contact faces of joint clean and dry.
      c. Clean out joints with a diamond impregnated saw blade equipped with a dustless vacuum system to ensure sides of joint walls are clean so that joint filler can bond with them.
   2. Install joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with floor surface after hardening.

3.08 WORKMANSHIP AND CLEANING

A. General:
   1. Keep premises clean and free of debris at all times.
   2. Remove spatter from adjoining surfaces that are to remain exposed.
   3. Repair damages to surface caused by cleaning operations.
   4. Remove debris from job site.

3.09 PROTECTION

A. Protect finished work until project is turned over to the Owner.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Concrete Block.

B. Clay Facing Brick.

C. Mortar and Grout.

D. Reinforcement and Anchorage.

E. Flashings.

F. Accessories.

G. Water repellent admixtures for concrete masonry units, mortar and grout.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections: Code required special tests and inspections.

B. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

C. Section 07 92 00 - Joint Sealers: Sealing control and expansion joints.

D. Section 07 90 05 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.04 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).

D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

E. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.

F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

H. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.

I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

L. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.

M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

N. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

O. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units; 2014.

P. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

Q. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

R. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar; 1992a (Reapproved 2008).

S. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2014.

T. ASTM C1357 - Standard Test Methods for Evaluating Masonry Bond Strength ; 2009.

U. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2014.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit four samples of decorative block and facing brick units to illustrate color, texture, and extremes of color range.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

F. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

G. Preblended, dry mortar mixes. Include description of type and lab results conforming to ASTM C270 Property Specification.

1.07 QUALITY ASSURANCE

A. Use water repellent admixtures for masonry units, mortar and grout by a single manufacturer.

B. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.

C. Perform Preconstruction Testing adhering to ASTM C780, Standard Test Method for Preconstrcution and Construction Evaluation for Mortars for Plain and Reinforced Unit Masonry specifications.

1.08 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.

B. Locate where directed.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos. Site batching components is prohibited.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on the drawings for specific locations.
   2. Special Shapes: Provide non-standard blocks configured for conditions as detailed.
   3. Non-Loadbearing Units: ASTM C129.
      a. Hollow block, as indicated.
   4. Integral Color Pre-Faced Units: ASTM C90, hollow block, with smooth resinous facing complying with ASTM C744.
      a. Colors and styles: manufacturer's standard color and texture.
      b. Manufacturers:
         1) Basis of Design: Nettleton Concrete Inc.
   5. Units with Integral Water Repellent: Concrete masonry units as specified in this section with polymeric liquid admixture added to concrete masonry units at the time of manufacture.
      a. Performance of Units with Integral Water Repellent:
         1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
            (a) No water visible on back of wall above flashing at the end of 24 hours.
            (b) No flow of water from flashing equal to or greater than 0.032 gallons per hour at the end of 24 hours.
            (c) No more than 25% of wall area above flashing visibly damp at end of test.
         2) Flexural Bond Strength: ASTM C1357; minimum 10% increase.
         3) Compressive Strength: ASTM C1314; maximum 5% decrease.
         4) Drying Shrinkage: ASTM C1148; maximum 5% increase in shrinkage.
      b. Use in combination with mortar and grout that also has integral water repellent admixture.
      c. Use water repellent admixtures for masonry units, mortar and grout by a single manufacturer.
      d. Manufacturers:
         1) Basis of Design: Grace Construction Products; Dry-Block Block Admixture: grace.com/construction/
         2) Substitutions: See Section 01 60 00 - Product Requirements.

2.02 BRICK UNITS

A. Facing Brick: ASTM C216, Type FBX, Grade SW.
   1. Color and texture: Basis of Design: ACME 058 Velour Shamrock 106201.
   2. Nominal size: Modular.
   3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.03 MORTAR AND GROUT MATERIALS

A. Masonry Cement: Not permitted.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
   1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979.

G. Water: Clean and potable.

H. Integral Water Repellent Admixture for Mortar and Grout: Polymeric liquid admixture added to mortar and grout at the time of manufacture.
   1. Use in combination with masonry units manufactured with integral water repellent admixture.
   2. Use only water repellent admixture for mortar and grout from the same manufacturer as water repellent admixture in masonry units.
   3. Meet or exceed performance specified for water repellent admixture used in masonry units.
   4. Manufacturers:
      a. Basis of Design: Grace Construction Products; Dry-Block Mortar Admixture: grace.com/construction/
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   5.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited: www.blok-lok.com.
   2. Hohmann & Barnard, Inc; 2-Seal Tie: www.h-b.com/sle.
   3. WIRE-BOND: www.wirebond.com.

B. Single Wythe Joint Reinforcement: Ladder type; ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

C. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 3-1/2 inches.

D. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.05 FLASHINGS

A. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) minimum total thickness; with cross laminated polyethylene top and bottom surfaces.

2.06 ACCESSORIES

A. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 3/8 inch wide by maximum lengths available.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
   1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

C. Weeps:
   1. Type: Polyester mesh.
   2. Manufacturers:
      a. Mortar Net Solutions: www.mortarnet.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Cavity Vents: Type: Polyethylene tubing.
   1. Manufacturers:
      a. Mortar Net Solutions: www.mortarnet.com.

b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Property Specification.
1. Prepackaged mortar meeting the requirements below such as Pro Mix or SpecMix acceptable. Masonry cement is not acceptable.
2. Masonry below grade and in contact with earth: Type S.
3. Exterior, non-loadbearing masonry: Type N.
4. Interior, non-loadbearing masonry: Type N.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix conforming to ASTM C270 Property Specifications. Site batching of components is prohibited.

C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Hot Weather Requirements: When ambient air temperatures rise to 90 degrees or above, implement hot weather construction requirements contained in ACI 530/530.1/ERTA.

B. Cold Weather Requirements: When ambient air temperature is below 40 degrees, implement cold weather construction requirements contained in ACI 530/530.1/ERTA.

C. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
1. Bond: Running; unless indicated otherwise.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Brick Units:
1. Bond: Running.
2. Coursing: Three units and three mortar joints to equal 8 inches.
3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 16 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

F. Concrete Wall Backup: Anchor veneer to concrete wall with anchors fitting into dovetail anchor slots in concrete wall. Space anchors at 16 inches on center vertically. Horizontal spacing shall match dovetail anchor slot spacing, 24 inches on center maximum. Where dovetail anchors are not provided or damaged beyond use, provide anchors approved by Architect/Engineer screwed to the wall. Corrugated anchors are not acceptable for use.

3.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Extend plastic, laminated, and concealed flashings to within 1/4 inch of exterior face of masonry.

3.10 LINTELS

A. Install loose steel lintels over openings.

B. Maintain minimum 8 inch bearing on each side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Size control joint in accordance with Section 07 90 05 for sealant performance.

C. Form expansion joint as detailed on drawings.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, fabricated metal frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.14 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests and inspections, as specified in Section 014533.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

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SECTION 04 27 31
REINFORCED UNIT MASONRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Concrete Block.

B. Concrete Brick.

C. Clay Facing Brick.

D. Mortar and Grout.

E. Reinforcement and Anchorage.

F. Lintels.

G. Accessories.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

C. Section 07 90 05 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.04 REFERENCE STANDARDS

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; 2011.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

D. ASTM C55 - Standard Specification for Concrete Building Brick; 2011.

E. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.

F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

G. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

H. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.

I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).

L. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

N. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

O. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

P. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

Q. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.

R. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

S. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2009.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar and grout.

C. Shop Drawings: Indicate bar sizes, spacings, reinforcement quantities, bending and cutting schedules, reinforcement supporting and spacing devices, and accessories.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.08 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on the drawings for specific locations.
   2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
   3. Load-Bearing Units: ASTM C90, light weight
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.
      c. Minimum Net Area Compressive Strength: As reqired per the Unit Strength Method of ACI 530/530.1 to meet the net area compressive strength of masonry f'm as indicated in the drawings.

B. Concrete Brick:
   1. Size: As indicated on drawings.
   2. Special Shapes: Provide non-standard brick configured for corners.

2.02 MORTAR AND GROUT MATERIALS

A. Masonry Cement: Not permitted.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.

G. Water: Clean and potable. Do not use wash water from ready mix truck.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Blok-Lok Limited; _____: www.blok-lok.com.
   2. Hohmann & Barnard, Inc; _____: www.h-b.com/sle.
   3. WIRE-BOND: www.wirebond.com.

B. Reinforcing Steel: Type specified in Section 03 20 00; size as indicated on drawings; galvanized finish.

C. Single Wythe Joint Reinforcement: Ladder type; ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

D. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

E. Post-Installed Anchors in Solid-Grouted Masonry:
   1. Mechanical Anchors: Tested and qualified for use in accordance with ICC-ES AC01 or AC106. Acceptable products include:
      a. SIMPSON STRONG-TIE "TITEN-HD" (ICC-ES ESR-1056)
      b. HILTI "KWIK HUS-EZ SCREW ANCHOR" (ICC-ESR-3056)
      c. POWERS "WEDGE-BOLT+" (ICC-ES ESR-1678)
      d. POWERS "TAPPER+" (ICC-ES ESR-3196)
      e. SIMPSON STRONG-TIE "WEDGE-ALL" (ICC-ES ESR-1396)
      f. SIMPSON STRONG-TIE "STRONG-BOLT 2" (IAMPO-ES ER0240)
      g. HILTI "KWIK BOLT 3" EXPANSION ANCHOR (ICC-ES ESR-1385)
      h. POWERS "POWER-STUD+ SD1" (ICC-ES ESR-2966)
   2. Adhesive Anchors: Tested and qualified for use in accordance with ICC-ES AC58. Acceptable products include:
      a. SIMPSON STRONG-TIE "SET" (ICC-ES ESR-1772)
      b. HILTI "HIT-HY 70 FAST CURE" (ICC-ES ESR-3342)
      c. SIMPSON STRONG-TIE "ACRYLIC-TIE" (ICC-ES ESR-5791)
      d. POWERS AC100+ GOLD" (ICC-ES ESR-3200)
      e. Steel anchor element shall be Hilti HAS-E, ASTM F1554 Grade 36, or ASTM A193, Grade B6, B8, or B8M continuously threaded rod.
   3. Substitution requests for products other than those specified shall be submitted by the contractor to the Architect Engineer along with calculations that are prepared and sealed by a registered professional engineer licensed in the State in which the project is located. The calculations shall demonstrate that the substituted product is capable of achieving the pertinent equivalent performance values (minimum) of the specified product using the appropriate design procedures and/or standard(s) as required by the building code.

2.04 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints. Rubber material conforms to ASTM D-2000 2AA-805 with a durometer hardness of 80 (+ or - 5) when tested in conformance with ASTM D 2240.
   1. Manufacturers:
      a. Blok-Lok Limited: www.blok-lok.com.
      b. Hohmann & Barnard, Inc; _____: www.h-b.com/sle.
      c. WIRE-BOND: www.wirebond.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Panels designed for installation at flashing locations.
    a. Manufacturers:
        1) Advanced Building Products Inc: www.advancedflashing.com.
        2) Mortar Net USA, Ltd: www.mortarnet.com.

C. Weeps: Polyester mesh.
1. Manufacturers:
    a. Mortar Net USA, Ltd: www.mortarnet.com.

D. Cavity Vent: Polyester mesh
1. Manufacturers
    a. Mortar Net USA, Ltd; Mortar Net Weep Vents: www.mortarnet.com.
    b. Substitutions: See Section 016000 (01600) - Product Requirements.

E. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 3/8 inch wide x by maximum lengths available.

F. Building Paper: ASTM D226/D226M, Type I ("No. 15") asphalt felt.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 LINTELS

A. Reinforced Concrete Masonry, as indicated on drawings.

B. Galvanized steel masonry lintels, as indicated on drawings.

C. Concrete Lintels: Precast units made form concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure lintels by same method used for concrete masonry units.

2.06 MORTAR MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Property Specification. Prepackaged mortar meeting the requirements below such as Pro Mix is acceptable. Masonry cement is not acceptable.
1. Load bearing masonry: Type S.
2. Masonry below grade and in contact with earth; Type S.
3. Masonry veneer above grade: Type N.
4. Interior, non-load bearing masonry: Type N.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix conforming to ASTM C270 Property Specifications. Site batching of components is prohibited.

C. Colored Mortar: Proportion selected pigments and other ingredients to match Architect Engineer's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

2.07 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.08 GROUT MIXES

A. Bond Beams, Lintels, and vertical cells: 2500 psi strength at 28 days; 9-11 inches slump; provide premixed type in accordance with ASTM C 94/C 94M.
1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.09 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.

D. Left over wash water in the ready mix truck drum is not allowed in the grout. Use only fresh, clean, potable water.

E. Do not use anti-freeze compounds to lower the freezing point of grout.

2.10 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01 40 00 and 01 45 33.

B. Clay Masonry: Test each type of clay masonry in accordance with ASTM C67.

C. Concrete Masonry: Test each type, class, and grade of concrete masonry unit in accordance with ASTM C140/C140M for conformance to requirements of this specification.

D. Mortar Mixes: Test mortars prebatched by weight in accordance with ASTM C780 recommendations for preconstruction testing.

E. Grout Mixes: Test grout batches in accordance with ASTM C1019 procedures.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Clean reinforcement of loose rust.

C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave.

D. Brick Units:
   1. Bond: Running.
   2. Coursing: Three units and three mortar joints to equal 8 inches.
   3. Mortar Joints: Concave.

3.04 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Lay precast concrete trim units in full bed of mortar with all joints slushed full. Fill dowel, anchor, and similar holes solid. Protect exposed surfaces from mortar staining. Clean soiled surfaces.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar as work progresses.

E. Interlock intersections and external corners of brick veneer unless othersise indicated.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

H. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, or cavity insulation vapor barrier adhesive is applied.

3.05 REINFORCEMENT AND ANCHORAGE

A. Reinforcement Bars: Secure at locations indicated and to avoid displacement during grouting. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.
   1. Welding of splices is not permitted.

B. Joint Reinforcement: Install horizontal joint reinforcement 16 inches on center, unless indicated otherwise.
   1. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
   2. Place continuous joint reinforcement in first and second joint below top of walls.
   3. Lap joint reinforcement ends minimum 6 inches.
   4. Use only prefabricated joint reinforcement corners and wall intersections

C. Wall Ties: Install wall ties at locations indicated, spaced at not more than 16 inches on center horizontally and 16 inches on center vertically, unless otherwise indicated on drawings.

D. Reinforced Hollow Unit Masonry: Keep vertical cores to be grouted clear of mortar, including bed area of first course.
   1. Bond Beams: At bond beams or other locations for horizontally reinforced masonry, provide special masonry units or saw to accommodate reinforcement.

E. Post-installed anchors:
   1. Shall only be used where specified on the construction documents. The contractor shall obtain approval from the Architect/Engineer prior to installing post-installed anchors in place of missing or misplaced cast-in-place anchors.
   2. Care shall be taken in placeing post-installed anchors to avoid conflicts with existing rebar.
   3. Hole shall be drilled and cleaned in accordance with the manufacturer's written instructions.
   4. Provide continuous or periodic inspection for all adhesive and mechanical anchors per the product's applicable ICC-ES Evaluation Report (ICC-ES ESR).
   5. Contact manufacturer's representative for the initiral training for installation of and for product related questions and availability. Call SIMPSON STRONG-TIE AT (800) 999-5099. Call HILTI at (800) 897-8000. Call POWERS AT (800) 423-6587.
   6. The contractor shall arrange an anchor manufacturer's representative to provide on-site installation training for all of their anchoring products specified.The Architect Engineer must receive documented confirmation that all of the contractor's personnel who install anchors are trained prior to the commencement of installing anchors.

3.06 GROUTING

A. Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

B. Comply with requirements in ACI 530.1 for grout placement, including minimum grout space and maximum pour height.

C. Limit height of vertical grout pours to not more than 64 inches.

3.07 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joint in accordance with Section 07 90 05 for sealant performance.

D. Form expansion joint as detailed on drawings.

3.08 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, fabricated metal frames, window frames, anchor bolts, and plates and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.09 TOLERANCES

A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.10 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 and 01 45 33.

B. The testing agency shall comply with the requirements of ASTM C1093.

C. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

D. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.

E. Mortar Tests: Test each type of mortar in accordance with recommended procedures in ASTM C780, testing with same frequency as masonry samples.

F. Test and evaluate grout in accordance with ASTM C1019 procedures.
   1. Test Frequency: Three samples per day when walls are being grouted but not less than once per 5000 square feet of wall.

G. Items requiring special inspection shall not be covered until inspected and approved by the special inspector. Items requiring special inspection that are covered and before approval by the special inspector are subject to removal of finishes as required for inspection. Cost of the removal and replacement of the finishes shall be at no additional cost to the owner.

H. Prism Tests: not required for this project.

3.12 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Structural steel framing members, support members.

B. Base plates, shear stud connectors.

C. Grouting under base plates.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 05 21 00 - Steel Joist Framing.

C. Section 05 31 00 - Steel Decking: Support framing for small openings in deck.

D. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

E. Section 07 81 00 - Applied Fireproofing: Fireproof protection to framing and metal deck systems.

F. Section 099000 - Painting and Coating

1.04 REFERENCE STANDARDS

A. ANSI/AISC 360 - Specification for Structural Steel Builidngs; American Institute of Steel Construction, Inc.; 2010

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2010

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

G. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

H. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

I. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

J. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

K. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).

L. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.

M. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

N. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

O. ASTM A1085 - Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS); 2013.

P. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

Q. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).

R. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.

S. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.

T. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2014.

U. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.

V. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

W. ASTM F1852 - Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2011.

X. ASTM F2280 - Standard Specification for “Twist Off” Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength; 2012.

Y. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

Z. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

AA. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2009.

AB. US Government Department of Labor; Occupational Safety and Health Administration; 29 CFR Part 1926, Safety Standards for Steel Erection.

AC. Specification for Structural Joints Using High Strength Bolts, Research Council on Strucutral Connnections; 2009.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections.
   3. Indicate cambers.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   5. Plans shall be at 1/8" = 1'-0" or larger scale.
   6. Contractor shall require the detailer to thoroughly check all shop drawings before sending for approval. All shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings, unchecked shop drawings and shop drawings that have not been reviewed by the Contractor will be returned without review by the Architect/Engineer.
   7. When there are more than 100 sheets of structural steel shop drawings contractor shall submit the shop drawings in sequences so that each of the submittals do not exceed 100 sheets. Divide the sequences to match the erection sequence of the building. Submit the applicable columns, erection plans, and details with each sequence.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

F. Testing and Inspection Laboratory qualifications.

1.06 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."

B. Fabricator: Fabricator shall be experienced in fabrication of steel similar to the steel required for this project with a minimum of 3 years of documented experience with a record of successful in-service performanace as well as sufficient production capacity to fabricate structural steel for this project without delaying the work.
   1. Fabricator must participate in the AISC Quality Certification Program and be designated an AISC-Certified Plant Category: BU (formerly STD); Certified Building Fabricators.

C. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

E. Testing and Inspection Agency Qualifications: an independent testing and inspection lab, acceptable to Architect/Engineer, shall perform specified tests and inspections. The testing lab shall be qualified according to ASTM C 1077 and ASTM E 329 for testing indicated as documented according to ASTM E 548. See Section 014533.

F. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Arkansas. All connections shall be shown in the shop drawings and are subject to the approval of the Architect/Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M or ASTM A572/A572M Grade 50.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Cold-Formed Structural Tubing: ASTM A500, Grade B or ASTM A1085

D. Pipe: ASTM A53/A53M, Grade B, Finish black.

E. Shear Stud Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Deformed Bar Anchors: A496, minimum yield strength 75 KSI

G. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M, Class C.

H. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, medium carbon, plain. Where load indicator bolts are indicated provide twist-off type conforming the ASTM F1852.

I. Tension Control Bolts: Twist-off type; ASTM F1852 or ASTM F2280.

J. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436 Type 1 washers.

K. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

L. Grout: Non-shrink, non-metallic aggregate type, complying with 1 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.

M. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

N. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible. Shop fabrication shall be in accordance with OSHA Safety Standards for Steel Erection.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP 2, 3 or better.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, or faying surfaces of a slip critical connection.

C. Galvanize structural steel members, where indicated, to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.04 SOURCE QUALITY CONTROL

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts", testing at least ____ percent of bolts at each connection.

B. Welded Connections: Visually inspect all shop-welded connections and test 100 percent of welds greater than 5/16" in thickness and all complete penetration welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

C. Charpy V-Notch testing of steel: ASTM A6/A6M hot rolled steel and plates shall be tested in accordance with ASTM A6/A6M, Supplementary Requirement S30, Charpy V-Notch (CVN) Impact Test for Structural Shapes - Alternate Core Location in the following instances:
   1. Typical Steel:
      a. Hot rolled shapes with a flange thickness exceeding 2 inches that are welded with complete-joint penetration groove welds.
      b. Plates exceeding 2 inches in thickness in heavy built up sections subjected to tensile forces.
      c. Plates exceeding 2 inches in thickness that are welded with complete-joint penetration groove welds to the face of other sections.
   2. Structural steel in the seismic lateral load resisting systems in buildings subject to the AISC Seismic Provisions (where the seismic design category is D, E, or F and/or the R is greater than 3):
      a. Hot rolled shapes with a flange thickness of 1-1/2 inches or thicker that are welded with complete-joint penetration groove welds.
      b. Plates that are 2 inches or more in thickness.
   3. The impact tests shall meet a minimum average value of 20 ft-lbs (27 J) absorbed energy at +70 degrees Farenheit (+20 degrees C).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" an in complicance with OSHA Safety Standards for Steel Erection.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on drawings.

D. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Where welds are exposed in the final construction, make fillet welds oversized and grind to uniform profile with smooth face and transition. Appearance of exposed welds shall be subject to the approval of the Architect.

E. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

F. Do not field cut or alter structural members without approval of Architect Engineer.

G. After erection, prime welds, abrasions, and surfaces not shop primed.

H. Galvanized Surfaces: After erection of galvanized steel clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780. Use a primer that matches the finish of the galanizing where the galvanized surface will be exposed in the final construction.

I. Grout solidly between column base plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

J. Shear Stud Connectors: Fusion weld studs to plates or beams with a stud welding gun in accordance with Chapter 7 of AWS D1.1. Do not fillet weld studs.

K. Deformed Bar Anchors: Fusion weld anchors to plates with a stud welding gun in accordance with Chapter 7 of AWS D1.1. Do not fillet weld deformed bar anchors.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency acceptable to the Architect/Engineer shall perform field quality control tests, as specified in Section 014533 (01410).

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts".

C. Welded Connections: Visually inspect all field-welded connections and test at least 50 percent of welds with a thickness greater than 5/16" and 50 percent of all complete penetration welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94.
   2. Ultrasonic testing performed in accordance with ASTM E164.
   3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
   4. Magnetic particle inspection performed in accordance with ASTM E709.

D. Welds that fail testing shall be repaired and retested at contractor's expense. If a weld fails testing all previous untested similar welds by the same welder shall be tested.

E. High Strength Blind Bolted Connections: Visually inspect all high strength blind bolted connections.

END OF SECTION

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SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Open web steel joists, with bridging, attached seats and anchors.

B. Supplementary framing for roof openings greater than 12 inches.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 05 12 00 - Structural Steel Framing: Superstructure framing.

C. Section 05 31 00 - Steel Decking: Support framing for openings less than 18 inches in decking.

D. Section 05 50 00 - Metal Fabrications: Non-framing steel fabrications attached to joists.

1.04 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

C. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

D. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

F. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.

G. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2008.

H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

I. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
   1. Plans shall be 1/8" = 1'-0" scale or larger.
   2. Submit 2 copies of each shop drawing for approval. One checked copy will be returned to the Contractor who will then run and distribute all copies required.
   3. Contractor shall require the detailer to thoroughly check all shop drawings before sending for approval. All shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings, unchecked shop drawings and shop drawings that have not been reviewed by the Contractor will be returned without review by the Architect/Engineer.

C. Material Certificates: Submit the following if requested by Architect/Engineer:
   1. Design verification tests on chord and web members, joints, and connections.
   2. Engineering design and calculations stamped and signed by a registered professional engineer licensed in the state where project is located.
   3. Fabricator's certificate of compliance for shop paint and application thereof.
   4. Fabricators quality control procedures for shop welding of connections.

D. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

E. Testing Laboratory Reports: Copies of all testing and inspection laboratory reports.

1.06 QUALITY ASSURANCE

A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.

B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

C. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

D. Qualifications For Welding Work: Qualify welding processes and welding operators per the requirements in Section 05 12 00 - Structural Steel.

E. Field Inspection: An independent inspection laboratory acceptable to the Architect Engineer shall perform field inspection of joists.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Joists:
   1. Canam Group Inc: www.canam-steeljoists.ws
   2. New Millennium: www.newmill.com
   3. Nucor-Vulcraft Group: www.vulcraft.com.
   4. Valley Joist, Inc: www.valleyjoist.com
   5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Open Web Joists: SJI Type LH Joists:
   1. Provide bottom chord extensions as indicated.
   2. Minimum End Bearing on Steel Supports: 4 inches.
   3. Minimum End Bearing on Masonry or Concrete Supports: 6 inches.
   4. Bearing depth of 5 inches.
   5. Finish: Shop primed.

B. Bolts, Nuts and Washers: ASTM A307, plain.

C. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or ASTM A325M, Type 1, medium carbon, galvanized, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436 washers.

D. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A 36/A 36M.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with SJI "Specifications" and VOC limitations of authorities having jurisdiction.

G. Bridging: Unless more stringent requirements are indicated on the drawings provide horizontal and diagonal type bridging for joists complying with SJI Specifications. Bridging members shall conform to ASTM A36 or A572-Grade 50. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

2.03 FABRICATION

A. General: Fabricate steel joists in accordance with SJI "Specifications."

B. Frame special sized openings in joist web framing as detailed.

2.04 FINISH

A. Shop prime joists as specified. Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint. Apply one shop coat of steel prime paint to joists and accessories. Provide a continuous dry paint film thickness of not less than 2 mil.

B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 ERECTION

A. Erect joists with correct bearing on supports. Field weld or bolt joists to supports as required by the drawings and SJI Specifications.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.

C. After joist alignment and installation of framing, field weld and/or bolt joist seats to steel bearing surfaces.

D. Coordinate placement of anchors in concrete construction for securing bearing plates.

E. Position and field weld joist chord extensions and wall attachments as detailed.

F. Install supplementary framing for roof openings greater than 12 inches.

G. Install bridging simultaneously with joists erection. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. Do not permit loads on the joists nor erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing. Comply with SJI specifications for erection of joists. Where open web joists are 40-feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

H. Do not field cut or alter structural members without approval of joist manufacturer..

I. After erection, prime welds and damaged shop primer .

J. Hanging Concentrated Loads from Joists: Concentrated loads shall not be hung from joists in excess of the amount indicated on the drawings or joist manufacturer's drawings. Where concentrated loads are hung from joists the load shall occur at a panel point or the joist chord shall be reinforced at the concentrated load as indicated on the drawings or the joist manufacturer's shop drawings.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. An independent testing agency shall perform field quality control inspections, as specified in Section 014533 (01410).

B. All joists shall be visually inspected after installation to assure compilance with the plans, specifications, joist manufacturer's shop drawings, SJI Specifications and guidelines, and for any damage during transit or erection. Members damaged during transit or erection shall be repaired and replaced to the satisfaction of the joist manufacturer and architect/engineer. The repair shall be inspected by the inspection agency for compliance with the joist manufacturer's instructions.

C. Connection Inspection: All bolting and welded connections shall be visually inspected for quantity and quality.

END OF SECTION

SECTION 05 31 00
STEEL DECKING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Composite floor deck.

B. Metal form deck.

C. Supplementary framing for openings up to and including 18 inches.

D. Stud shear connectors.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete: Concrete topping over metal deck.

D. Section 05 12 00 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

E. Section 05 50 00 - Metal Fabrications: Steel angle concrete stops at deck edges.

1.04 REFERENCE STANDARDS

A. ANSI/ASSE A10.3 - Safety Requirements for Powder-Actuated Fastening System; 2013.

B. ANSI/SDI C - Standard for Composite Steel Deck-Slabs, Steel Deck Institute; 2011

C. ANSI/SDI NC - Standard for Non-Composite Steel Deck, Steel Deck Institute; 2010

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

F. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2008.

G. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; Factory Mutual System; 2006.

H. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; ICC Evaluation Service, Inc; 2010 (R2013).

I. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; ICC Evaluation Service, Inc; 2013.

J. SDI DDM03 - Diaphragm Design Manual Third Edition, including latest errata and addendum; Steel Deck Institure; 2004

K. SDI COSP - Code of Standard Practice; Steel Deck Institute; 2014

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Shop Drawings: Submit detailed shop drawings showing layout and types of deck panels, weld or mechanical fastener types and sizes, weld or mechanical fastener patterns, conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories. Where variances in substrate thickness require the use of multiple mechanical fastener types, the layout locations of each fastener type must be clearly indicated

in plan on the shop drawings. Include calculations and required information if not completely covered by load tables and products data.

C. Mechanical fasteners shall be permitted to fasten deck to support framing where specifically indicated on the Drawings or in lieu of welding where approved by the Architect Engineer. Where mechanical fasteners are proposed in lieu of welds, include calculations in accordance with SDI Diaphragm Design Manual, 3rd Ed., indicating equivalent diaphragm strength to specified attachment pattern.

D. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

E. Certificates: Certify that products furnished meet or exceed specified requirements.

F. Submit manufacturer's installation instructions.

G. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.06 QUALITY ASSURANCE

A. An independent special inspector shall:
   1. Verify placement of deck for alignment and proper lap.
   2. Verify deck gage.
   3. The inspector shall verify welding procedures and welder qualifications prior to the start of work.
   4. Welds: Visually inspect 100% of welded connections for proper size, quality, and pattern. Measure all weld sizes where adequacy is inconclusive based on a visual inspection. All welds with inadequate size or other deficiencies must be repaired.
   5. Mechanical fasteners: Visually inspect 100% of connections for proper type, embedment, and spacing. Examine washer condition and ensure deck is clamped to the supporting steel framing. Measure all fastener embedments where adequacy is inconclusive based on a visual inspection. All deficient mechanical connectors must be corrected by replacing the deficient connector.
   6. Verify sidelap connections.
   7. Verify shear stud installation spacing and welds.

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of documented experience.
   1. All personnel installing steel deck mechanical fasteners shall be trained and licensed on the project site by a manufacturer’s representative.

C. Qualifications for welding work: Qualify welding processes and welding operators per the requirements in Section 05120 STRUCTURAL STEEL.

D. Operators of Powder-actuated tools shall be certified in accordance with ANSI/ASSE A10.3.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. Canam Steel Corporation; ____: www.canam-steeljoists.ws.
   2. Cordeck, Inc; _____: www.cordeck.com.
   3. Nucor-Vulcraft Group; ____: www.vulcraft.com.
   4. ASC Steel Deck: www.ascsd.com.
   5. New Millennium : www.newmill.com
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 STEEL DECK

A. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 minimum, with G90/Z275 galvanized coating.
   2. Structural Properties:
      a. Provide deck type and minimum properties as indicated on the drawings.

B. Metal Form Deck: Corrugated sheet steel:
   1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230 minimum, with G90/Z275 galvanized coating.
   2. Structural Properties: provide deck type and minimum properties as indicated on the drawings.

2.03 ACCESSORY MATERIALS

A. Stud Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

B. Welding Materials: AWS D1.1/D1.1M.

C. Fasteners: Galvanized hardened steel, self tapping.

D. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
   1. Design Requirements: Provide number and type of fasteners that comply with the applicable requirements of SDI design method for roof deck and floor deck applications, ICC-ES AC 43, FM wind uplift resistance, and specified UL fire-rated roof assembly.
   2. Where fasteners are exposed to the elements in their final condition, an AISI 304 stainless steel sealing cap with bonded neoprene washer shall be installed over each fastener. Alternately, fasteners with coatings that have met the requirements of ASTM G85 Annex E for 140 cycles are permitted.

E. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
   1. Design Requirements for Sidelap Connections: Provide number and type of fasteners that comply with the applicable requirements of SDI design method for roof deck and floor deck applications, ICC-ES AC43, and FM wind uplift resistance.

F. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

G. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 20 gage, 0.0359 inch thick sheet steel; of profile and size as indicated; finished same as deck.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with manufacturer's instructions and SDI Code of Standard Practice and ANSI/SDI Standards for each deck type . Align and level.

B. On concrete and masonry surfaces provide minimum 4 inch bearing.

C. On steel supports provide minimum 1-1/2 inch bearing.

D. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods indicated on drawings.

E. At mechanically fastened male/female side laps fasten at 24 inches on center maximum, unless indicated otherwise on drawings.

F. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.

G. Weld deck in accordance with AWS D1.3/D1.3M.

H. At deck openings from 6 inches to 18 inches in size, provide 2 by 2 by 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and mechanically anchor or puddle weld to deck at each flute.

I. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Puddle weld 12 inches on center maximum.

J. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.

K. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

L. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

M. Weld shear shear connectors through steel deck to structural members below using automatic mechanized welding gun. Do not fillet weld.

N. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

3.03 WELDING

A. All welding of deck shall be in accordance with ANSI/AWS D1.3, Structural Welding Code – Sheet Steel. Each welder shall demonstrate an ability to produce satisfactory welds using a procedure such as shown in the ANSI/SDI Standards and as described in ANSI/AWS D1.3.

B. Provide weld washers for deck thinner than 22 gage.

C. Weld metal shall penetrate all layers of deck material at end laps and shall have good fusion to the supporting members.

D. Where two panels butt, fasten each deck unit with separate welds.

3.04 MECHANICAL FASTENING

A. Gauge powder-actuated tool systems to the base material steel type, steel deck type and thickness prior to final installation. Confirm appropriate power regulation and powder-actuated cartridge type prior to final installation.

B. Verify axis of fastener is within +/- 10 degrees of perpendicular to the deck prior to driving.

C. Where two panels butt, fasten each deck unit with separate fasteners.

3.05 NONCONFORMING WORK AND REPAIRS

A. Work not conforming with the contract documents shall be repaired or replaced at the Contractor’s expense.

B. Additional testing and inspection required to determine compliance of corrected work shall be at the Contractor’s expense.

C. Repair damaged galvanized coatings on both surfaces of the deck with galvanized repair paint according to ASTM A780 and manufacturer’s written instructions.

D. Repair damaged paint coatings on painted sides of the deck with repair paint.
   1. Wire brush and clean rust spots, welds, and abraded areas.
   2. Repair paint shall be of same color as shop-primed deck where exposed to view.

E. Replace or supplement under-driven and over-driven mechanical fasteners with adjacent, properly installed fasteners.

3.06 QUALITY CONTROL

A. A qualified representative from the manufacturer of mechanical fasteners used to anchor deck to supporting structure shall conduct a pre-installation conference with all contractors involved in installing the metal deck. The manufacturer's representative shall visit the project site and inspect the start up of deck anchorage to insure that the correct fastener type, location and installation procedures are followed. A written report of the meeting and inspection by the manufacturer's representative shall be forwarded to the Architect Engineer.

B. All deck fastening to supports and sidelap fastener installation will be visually inspected for quantity and quality by a independent special inspector. See Section 014533 (01410).
   1. Connections and welds that are found unsatisfactory by the inspecting laboratory shall be corrected to the satisfaction of the inspector at the Contractor's expense. A copy of the final report shall be submitted to the Architect Engineer for review.
   2. Connections, welds, and shear studs shall not be covered or made inaccessible until the final approval is obtained.

END OF SECTION

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Formed steel stud exterior wall framing.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 13 34 19: Structural building framing.

1.04 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2007.

C. AISI S200 - North American Standard for Cold-Formed Steel Framing - General Provisions; American Iron and Steel Institute; 2007.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a.

G. ASTM A1003/A1003 - Standard Specification for Steel Sheet, Carbon, Metaliic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2013.

H. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2004.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Describe method for securing studs to tracks and for _____ framing connections.

E. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

F. Research/Evaluation Reports: For cold-formed steel framing.
   1. Metal stud manufacturer to have a third party evaluation report for its products that are reviewed to the local building code or its model code (IBC 2012 and AISI S100).

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.
   1. Manufacturer must participate in a third party code compliance certification program.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

1.08 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI's "Code of Standard Practice".

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. Clarkwestern Dietrich Building Systems LLC; ____: www.clarkdietrich.com.
   2. Marino; ____: www.marinoware.com.
   3. The Steel Network, Inc; _____: www.SteelNetwork.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Simpson Strong Tie: www.strongtie.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

2.03 FRAMING MATERIALS

A. Steel Sheet for studs, joists and tracks: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: ST33H, unless indicated otherwise.
   2. Coating: G90.

B. Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as indicated on drawings.

C. Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as indicated on drawings.

D. Framing Accessories:
   1. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
   2. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

E. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 40 (minimum), or ASTM A1003/A1003M, Grade 50, with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.

2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
    a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
    b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
    c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

C. Welding: In conformance with AWS D1.1/D1.1M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Coordinate work of this section with the placement of components within the metal framing system.

C. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions, ASTM C1007 requirements, and AISI S200.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 16 inches on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center unless indicated otherwise on drawings; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using indicated method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach cross studs to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 FIELD QUALITY CONTROL

A. The indepedant Special Inspectors shall verify that cold-formed metal framing is installed in accordance with the construction documents and approved shop drawings. See Section 014533 .

B. Remove and replace work where test results indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.04 TOLERANCES

A. Maximum Variation from True Position: 1/2 inch.

B. Maximum Variation of any Member from Plane: 1/2 inch.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Shop fabricated steel items.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

C. Section 04 27 31 - Reinforced Unit Masonry: Placement of metal fabrications in masonry.

D. Section 051200 - Structural Steel: Structural _____ anchor bolts.

E. Section 05 52 13 - Pipe and Tube Railings.

F. Section 09 91 13 - Exterior Painting: Paint finish.

1.04 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.

F. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.

G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

H. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2007.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

K. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

M. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 24 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M or ASTM A572/A572M Grade 50.

B. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.

C. Plates: ASTM A 36.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, galvanized to ASTM A153/A153M where connecting galvanized components.

F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

B. Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.

C. Lintels: As detailed; galvanized finish.

D. Door Frames for Overhead Door Openings: Channel sections; prime paint finish.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

C. Remove all erection angles and plates and grind welds smooth where the steel will be exposed in the final construction.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components as indicated on drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 051200 (05120) - Structural Steel Framing. An independent testing agency acceptable to the Architect/Engineer shall perform special inspections and tests, as specified in Section 014533 (01410) Special Inspections.

END OF SECTION

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SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

C. Section 04 20 00 - Unit Masonry: Placement of anchors in masonry.

D. Section 04 27 31 - Reinforced Unit Masonry: Placement of anchors in masonry.

E. Section 051200 - Structural Steel Framing: Field Quality Control

F. Section 05 51 00 - Metal Stairs: Attachment plates for handrails specified in this section.

G. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.04 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

E. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

F. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

C. Submit 2 copies of each shop drawing for approval. One checked copy will be returned to the Contractor who will then run and distribute all copies required.

D. Contractor shall require the detailer to thoroughly check all shop drawings before sending for approval. All shop drawings shall be reviewed and stamped by the general contractor prior to submittal. Incomplete shop drawings, unchecked shop drawings and shop drawings that have not been reviewed by the Contractor will be returned without review by the Architect/Engineer.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.
   4. Posts: Provide adjustable flanged brackets.

E. Provide mechanical and welding fittings where indicated to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M, Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 80, black finish.

C. Steel Plates, Shapes and Bars: ASTM A36/A36M or ASTM A572/A572M.

D. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

E. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

F. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

G. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 051200 - Structural Steel Framing. An independent testing agency acceptable to the Architect/Engineer shall perform field quality control inspections and tests, as specified in Section 014533 Special Inspections.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Non-structural dimension lumber framing.

B. Subflooring.

C. Roofing nailers.

D. Preservative treated wood materials.

E. Fire retardant treated wood materials.

F. Miscellaneous framing and sheathing.

G. Communications and electrical room mounting boards.

H. Concealed wood blocking, nailers, and supports.

I. Miscellaneous wood nailers, furring, and grounds.

1.03 REFERENCE STANDARDS

A. AFPA (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2012.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.

E. PS 1 - Structural Plywood; 2009.

F. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

G. PS 20 - American Softwood Lumber Standard; 2010.

H. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Samples: For rough carpentry members that will be exposed to view, submit two samples, illustrating wood grain, color, and general appearance.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service

for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
1. Bond Classification: Exterior.
2. Span Rating: 48.
3. Performance Category: 3/4 PERF CAT.
4. Edges: Tongue and groove.
5. Surface Layer: Masonite 1/4 inch painted flat black.

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Subfloor Glue: Waterproof, air cure type, cartridge dispensed.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
1. Manufacturers:
a. Arch Wood Protection, Inc: www.wolmanizedwood.com.
b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com.
c. Viance, LLC: www.treatedwood.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

3.02 FRAMING INSTALLATION

A. Set framing members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Install framing members full length without splices unless otherwise specifically detailed.

C. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AFPA Wood Frame Construction Manual.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Provide the following specific non-structural framing and blocking:
1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
1. Install board over gypsum wall board.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal:
1. Comply with applicable regulations.
2. Do not burn scrap on project site.
3. Do not burn scraps that have been pressure treated.
4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Hardware and attachment accessories.

1.03 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Painting and finishing of finish carpentry items.

1.04 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Samples: Submit two samples of wood 6 inch long.

1.06 SITE CONDITIONS

A. Install conditions for the area should remain for the proper occupied conditions of humidity and temperature (humidity min. 25% - max. 55%, temperature not to exceed 86 degrees).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI (AWS) for Custom Grade.

B. Interior Woodwork Items:
   1. Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish, where indicated on drawings.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LUMBER MATERIALS

A. Hardwood Lumber: Maple species, plain-sliced sawn, maximum moisture content of 6 percent, of quality suitable for transparent finish.

2.04 FASTENINGS

A. Fasteners: Of size and type to suit application.

2.05 ACCESSORIES

A. Primer: as specified in Section 09 90 00.

B. Wood Filler: Solvent base, tinted to match surface finish color.

2.06 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.07 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 11, Polyurethane, Catalyzed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

A. Set and secure materials and components in place, plumb and level.

B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

C. Install according to details on drawings.

D. Upon completion of installation, panels shall be inspected and cleaned as needed.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 41 00
ARCHITECTURAL WOOD MILLWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

C. Casework.

D. Preparation for installing utilities.

1.03 RELATED REQUIREMENTS

A. Section 12 36 00 - Countertops.

B. Section 09 91 23 - Interior Painting: Site finishing of cabinet exterior.

1.04 REFERENCE STANDARDS

A. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

C. Product Data: Provide data for hardware accessories.

D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches square, illustrating proposed cabinet substrate and finish.

E. Samples: Submit verification samples for each surface finish material. Minimum size 3" x 3".

F. Samples: Submit actual sample items of proposed pulls, demonstrating hardware design, quality, and finish.

G. Adhesive manufacturer's product data for each adhesive used indicating that the adhesive contains no urea formaldehyde.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

B. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Premium quality, unless other quality is indicated for specific items.

C. Perform cabinet construction in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Premium quality, unless other quality is indicated for specific items.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

E. Manufacturer Qualifications: Member in good standing of the Architectural Woodwork Institute (AWI) and familiar with the AWI/AWMAC QSI.

F. Quality Certification: Provide inspection and quality certification of completed custom cabinets in accordance with AWI/AWMAC Quality Certification Program.

1.07 MOCK-UP

A. Provide mock-up of typical base cabinet, wall cabinet, and countertop, that would be typical in classroom, including hardware and finishes.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.09 ENVIRONMENTAL REQUIREMENTS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 MANUFACTURED CABINETS

A. Contractor, at its option, may provide manufactured modular laminate clad casework in lieu of custom cabinets, subject to specified quality standard.

2.02 LUMBER MATERIALS

A. Softwood Lumber: NIST PS 20; Graded in accordance with, Grade I/Premium; average moisture content of 5-10 percent; species as recommended by manufacturer.

B. Hardwood Lumber: NHLA; Graded in accordance with, Grade I/Premium; average moisture content of 5-10 percent; species as recommended by manufacturer.

2.03 PANEL MATERIALS

A. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with Type II moisture resistant adhesive to suit application; sanded faces; thickness as required.
   1. Use for concealed components and components indicated on the drawings.

B. PVC Edgebanding 3mm: Use PVC edgebanding matching color, for exposed portions of cabinetry, where indicated.

2.04 LAMINATE MATERIALS

A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as indicated on Color and Finish Schedule.
   1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, through color, colors as scheduled, finish as scheduled.
   3. Cabinet Liner: CLS, 0.020 inch nominal thickness, through color, color as selected,.
   4. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.
   5. Melamine (MCP): Thermally fused melamine laminate, NEMA Test LD 3-1995.
      a. Use in locations not exposed to view, as indicated on Drawings.
      b. Color: White.

2.05 COUNTERTOPS

A. Countertops: See Section 123600 Countertops for laminate and solid surface countertops.

2.06 ACCESSORIES

A. Adhesive: Type recommended by AWI/AWMAC to suit application.

B. Plastic Edge Banding: 3mm Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness, at doors and drawers.
   1. Color: As scheduled.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded steel.

2.07 HARDWARE

A. Hardware shall comply with ADA Accessibility Guidelines, 28 CFR Part 36, Appendix A. Hardware and operating mechanisms shall have a shape that is easy to grasp and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to operate the hardware, doors or drawers shall be no greater than 5 pounds force.

B. Hardware: BHMA A156.9, types as scheduled on Drawings for quality grade specified.

C. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards and coordinated self rests, polished chrome finish, for nominal 1 inch spacing adjustments or as indicated on Drawings.

D. Drawer and Door Pulls:
   1. Basis of Design: Hafele, Crescent Series, Matt Chrome Steel pulls: Item # 117.31.418; as manufactured by Hafele; www.hafele.com.

E. Cabinet Locks: Keyed cylinder, on lock locations indicated on Drawings, two keys per lock, master keyed, finish to match pulls.

F. Catches: Magnetic.

G. Metal Support Brackets: L-shaped, heavy duty steel.

H. Adjustable Glides: Non-Swivel, heavy-duty metal, adjustable glides, equal to Emperor Model as manufactured by Carpin, or as approved by Architect Engineer.

I. Grommets: Plastic grommet equal to Innovator Grommet, Model # INNV1 as manufactured by Doug Mockett & Company, or as approved by Architect Engineer.

J. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Commercial grade.
   3. Mounting: Side mounted.
   4. Stops: Integral type.
   5. Features: Provide self closing/stay closed type.
   6. Manufacturers:
      a. Accuride International, Inc: www.accuride.com.
      b. Grass America Inc: www.grassusa.com.
      c. Knape & Vogt Manufacturing Company: www.kv.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

K. Hinges: European style concealed self-closing type, steel with polished finish.
   1. Hinges should open beyond 90 degrees.
   2. Manufacturers:
      a. Grass America Inc: www.grassusa.com.
      b. Hardware Resources: www.hardwareresources.com.
      c. Julius Blum, Inc: www.blum.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2.08 FABRICATION

A. Cabinet Style: Flush overlay.

B. Cabinet Doors and Drawer Fronts: Flush style.

C. Drawer Construction Technique: As recommended by fabricator.

D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

H. Mechanically fasten back splash to countertops with steel brackets at 16 inches on center.

I. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.09 FACTORY FINISHING

A. Sand work smooth and set exposed nails and screws.

B. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

C. Finish work in accordance with AWI/AWMAC/WI Architectural Woodwork Standards (AWS), Section 5 - Finishing for Grade specified and as follows:
   1. Transparent:
      a. System - 11, Polyurethane, Catalyzed.
      b. Stain: As selected by Architect Engineer.
      c. Sheen: As selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Secure cabinets to floor using appropriate angles and anchorages.

E. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 64 00
FIBERGLASS REINFORCED PLASTIC PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced polyester (FRP) panel system for adhesive mounting.

B. Moldings, adhesive, and joint sealants.

1.02 REFERENCES

A. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for Panels.

C. Verification Samples: Submit two samples 10 inch in size illustrating finish, color, and sheen.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver Plastic Fabrications, systems and specified items in manufacturer’s standard protective packaging.

B. Do not deliver Plastic Fabrications, system, components and accessories to Project site until areas are ready for installation.

C. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.

D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.

E. Before installing Plastic Fabrications, permit them to reach room temperature.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable

B. Basis of Design Manufacturer: Crane Composites, Sandstone texture; www.cranecomposites.com. 1.800.435.0080; or equal.

C. Substitutions: Section 016000 - Product Requirements.

2.02 PANEL SYSTEM

A. Panels shall have a wear side with a gel coat finish, textured as indicated in Finish Schedule. Color shall be uniform throughout, as specified. The backside shall be smooth. The backside of the panel is comprised of a polyester copolymer surface that is adhesive, foam, and lamination friendly with no additional preparation needed as long as the surface is dirt and oil free.

B. FRP does not support mold or mildew (per ASTM D3273 and ASTM D3274).

C. Meets minimum requirements of major model building codes for Class C interior wall and ceiling finishes of flame spread < or = 200, smoke developed 450 or less (per ASTM E-84)

D. Crane Composites certifies that Innovative Finishes (SMXGJ meets the requirements of ASTM D5319.

E. Plastic Panel System: Factory finished panels, trim, sealant, and accessories.

F. Panel Trim: Extruded PVC, in manufacturer's standard colors.

G. Outside corners, inside corners, edge trim, and division molding.

H. Sealant: Silicone Sealant; gunnable silicone rubber; clear, as recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Take panels out of cartons and allow to acclimatize to room conditions for at least 48 hours prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.

D. Protect existing surfaces from damage due to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use the adhesives recommended by the panel manufacturer unless prohibited by local regulations; obtain manufacturer's approval of alternative adhesives.

C. Install continuous bead of silicone sealant in each joint and trim groove and between trim and adjacent construction, maintaining 1/8 inch expansion space.

D. Avoid contamination of panel faces with adhesives, solvents, or cleaners; clean as necessary and replace if not possible to repair to original condition.

E. Protect installed products until completion of project.

F. Touch-up, repair or replace damaged products after Substantial Completion.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Board insulation at perimeter foundation wall.

B. Batt insulation in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.03 REFERENCE STANDARDS

A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016.

F. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene board.

B. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, and the following characteristics:
   1. Type: ASTM C578.
   2. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   3. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   4. R-value; 1 inch of material at 72 degrees F: 5, minimum.
   5. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Board Edges: Square.

7. Water Absorption, Maximum: 0.3 percent, by volume.
8. Manufacturers:
   a. Dow Chemical Company; _____: www.dow.com.
   b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/sle.
   c. Kingspan Insulation LLC; GreenGuard XPS TYPE IV 25 PSI: www.trustgreenguard.com.
9. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 BATT INSULATION MATERIALS

A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   2. Formaldehyde Content: Zero.
   3. Thermal Resistance: R-value of 19.
   4. Thickness: 6 inch.
   5. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com.
      b. Johns Manville: www.jm.com.
      c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/sle.

2.04 ACCESSORIES

A. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch thick.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 22 00

CONTINUOUS THERMAL INSULATION SYSTEM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Continuous fiberglass faced foam-plastic board insulation system.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Field-applied termiticide for concrete slabs and foundations.

B. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

C. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

D. Section 07 42 13 - Metal Wall Panels.

1.04 REFERENCE STANDARDS

A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Insulation:
   1. Basis of Design: Enverge CI Glass Exterior Wall Insulation, as manufactured by Firestone Building Solutions www.firestonebpco.com.
   2. Thermax Ci Exterior Insulation as manufactured by Dow; www.thermaxwallsystem.com
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289; Type II, Class 1, cellulose felt or glass fiber mat both faces; Grade 1.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   4. Minimum Compressive Strength ≥20 psi when tested per ASTM D1621.
   5. Minimum Tensile Strength ≥1000 when tested per ASTM C209.

6. Minimum Flexural Strength 40 psi when tested per ASTM C203.
7. Compressive Strength: 16 psi
8. Board Thickness: 2 inch.
9. Board Edges: Square.

2.03 ACCESSORIES

A. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

B. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
   1. Length as required for thickness of insulation material and penetration of deck substrate, .
   2. For attachment over wood or steel framing, provide Rodenhouse Grip-Loc Auto Feed fastening system fasteners of length long enough to penetrate framing a minimum of 1 inch.
   3. For attachment over masonry and concrete back-up, provide Rodenhouse Plasti-Grip PMF fasteners.

C. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer for application. Polyurethane construction adhesive with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates. Acceptable products include:
   1. LN 950 as manufactured by liquid Nails Adhesive 800-634-0015.

D. Flashing membrane for EPDM compatible systems:
   1. Enverge™ 40 mil EPDM FlashGard Thru-Wall Self Adhered Flashing.
   2. Enverge™ 40 mil EPDM FlashGard Thru-Wall Reinforced Flashing.
   3. Bonding Adhesive as manufactured by Firestone Building Products LLC.
   4. Splice Wash as manufactured by Firestone Building Products LLC.
   5. Flashing and sealants as recommended by manufacturer.

E. Sealant: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates and a demonstrated compatibility with adjacent wall components and flashings. Acceptable products include: Lap sealant and Elastomeric sealer as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 INSTALLATION, GENERAL

A. Install insulation with the long edge horizontal and either side to the exterior.

B. Install in as large of pieces as possible to minimize joints.

C. Offset successive courses of insulation by a minimum of one stud space in framed installations or 16 inches in solid back-up installations.

D. Abut wall insulation tightly together both horizontally and vertically, and at all openings.

E. Comply with insulation manufacturer's written installation instructions.

F. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

G. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

H. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths.

I. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

J. Stagger successive layers a minimum of 16” both vertically and horizontally so joints in successive layers do not align.

3.03 INSTALLATION ON MASONRY BACK-UP

A. Adhesive Installation:
   1. Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face, and as recommended by adhesive manufacturer.
   2. Fit courses of insulation between wall ties and other obstructions, with edges butted
   3. tightly in both directions. Press units firmly against inside substrates.
   4. Supplement adhesive attachment of insulation by securing boards with plastic masonry fasteners at 24” o.c. both horizontal and vertical.

B. Mechanical Fastener Installation:
   1. Fasten insulation to mockup using manufacturer's acceptable integral plastic washers and fasteners as applicable for type of back-up and insulation thickness.
   2. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
   3. Install field fasteners at 12” o.c. vertically and 16” o.c. horizontally.
   4. Install edge fasteners at 12” o.c. around perimeter of each board.

3.04 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Comply with manufacturer's written instructions.for type of framing.
   1. Install field fasteners at 12” o.c. vertically and 16” o.c. horizontally.
   2. Install edge fasteners at 12” o.c. around perimeter of each board.

B. Fasten insulation to framing using manufacturer’s acceptable screws and washers as applicable.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

B. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Do not leave continuous insulation uncovered and exposed to UV for longer than an agregate of 60 days between storage and uncovered installation.

END OF SECTION

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SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.03 RELATED REQUIREMENTS

A. Section 042731 - Reinforced Unit Masonry, thru wall flashing and wall ties installed in conjunction with weather barriers.

B. Section 072200 - Continuous Thermal Insulation: Vapor retarder installed in conjunction with board insulation.

C. Section 07 53 00 - Elastomeric Membrane Roofing: Vapor retarder installed as part of roofing system.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

E. Section 07 92 00 - Joint Sealers: Sealing building expansion joints.

F. Section 09 21 16 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

G. Section 13 34 19 - Metal Building Systems: Wall and roof panels.

1.04 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

1.05 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2015a.

B. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

C. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section and related Work; require attendance by all affected installers.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Shop Drawings: Provide drawings of special joint conditions.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

E. Manufacturer's Installation Instructions: Indicate preparation.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.08 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/sle:
   1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.09 MOCK-UP

A. Install air barrier, vapor retarder, water-resistive barrier, and transition materials in mock-up.

1.10 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Special Project Installation Warranty: General Contractor to provide an installation warranty signed by the General Contractor, covering Work of this Section, including labor and all components of weather barrier system such as through wall flashing, flexible flashings, joints, transitions to other substrates, transitions to opening frames, transitions to roofing systems, and roofing systems for complete weather barrier system for Warranty Period of 10 years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES

A. Weather barriers shall be NFPA 285 compliant.

B. Air Barrier:
   1. On outside surface of inside wythe of exterior masonry cavity walls and where indicated on drawings, use air barrier coating.
   2. On outside surface of sheathing of exterior walls use air barrier coating.

2.02 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.
   1. Air Barrier Coating:
      a. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
      b. Water Vapor Permeance: 25 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
      c. Products:
         1) Grace Construction Products; Perm-A-Barrier VPL: www.graceconstruction.com.
            (a) Coverage Rates: Apply at a minimum of 90 mils wet and 45 mils dry thickness.
         2) Tremco Global Sealants; ExoAir 230; www.tremcosealants.com.
            (a) Coverage Rates: Apply at a minimum of 70 mils wet and 35 mils dry thickness, dark in color, color to be selected by Architect Engineer.

3) Henry Company; Air-Bloc 31MR; www.henry.com.
   (a) Coverage Rates: Apply at a minimum of 70 mils wet and 35 mils dry thickness, dark in color.
4) Substitutions: See Section 01 60 00 - Product Requirements.

2.03 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
   1. Composition: Modified SBS rubberized asphalt sheet laminated to an 8 mil cross-laminated, high density, polyethylene sheet with a siliconized release liner. Total thickness 40 mil, nominal.
   2. Products:
      a. Grace Construction Products; Perm-A-Barrier Wall Flashing: www.na.graceconstruction.com.
      b. Tremco Global Sealants; ExoAir TWF; www.tremcosealants.com.
      c. Henry Company; Blueskin WB; www.henry.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Flexible Flashing shall be provided by, or recommended by, manufacturer of weather barrier.

D. Pre-formed Transition Membrane: Semi-rigid silicone composition, tapered edges, tear resistant.
   1. Engineered Transition Assemblies (ETA)
      a. Basis of Design: Proglaze Engineered Transition Assembly (ETA) as manufactured by Tremco, Inc. www.tremco.com.
      b. Pre-engineered, finished aluminum and silicone materials used as a transition assembly. The system assembly is mechanically attached to the door and window assemblies to assure a durable seal is achieved. The engineered transitions assembly is comprised of the following components:
         1) Silicone Rubber Sheet (SRE): Extruded, 40 durometer, translucent silicone, with a lock-in rubber dart.
         2) Silicone Rubber Corners (SRC): Pre-molded, 40 durometer, translucent silicone, with a lock in rubber dart.
         3) Silicone Sealants: Comply with ASTM C 920, single-component, neutral-curing silicone; Class 100/50, Grade NS, Use O. Product shall be: Spectrem 1 as manufactured by Tremco.
         4) Extruded Aluminum Attachment (EAA): Alodine finished, with pre-engineered race for receiving silicone lock-in rubber dart. Extrusion is supplied in 5 foot lengths with predrilled holes. Butyl Tape: 100% solid Polyisobutylene-cross linked butyl preformed sealant.
   2. Accessories
      a. Silicone Sealant: Spectrem 1 Silicone Sealant.
      b. Metal screws to be installed every 12 inches or as recommended by manufacturer. Minimum size screw is a #10 x 3/4 inch PHT. Larger screws may be used, but must be approved by the window and/or wall manufacturer.
   3. Products:
      a. Momentive Performance Materials, Inc./GE Construction Sealants; UST2200 UltraSpan: www.siliconeforbuilding.com/sle.
      b. Dow Corning Corporation; Silicone Transition Strip: www.dowcorning.com/construction/sle.
      c. Pecora Corporation; Pecora XL-SPAN: www.pecora.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Flash windows and doors with window and door seal as specified in Section 072520 Air Barrier Window and Door Perimeter Seal.

D. Coatings:
   1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
   2. Use flashing to seal to adjacent construction and to bridge joints.

E. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with at least 4 inches wide; do not seal sill flange.
   3. At openings to be filled with non-flanged frames, seal weather barrier to all sides of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
   4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
   5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.

C. Provide the services of the manufacturer's field representative to observe installation and make report.

D. Do not cover installed weather barriers until required inspections have been completed.

E. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

F. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

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SECTION 07 25 20

AIR BARRIER WINDOW AND DOOR PERIMETER SEALING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Perimeter air barrier seal for windows, doors, and storefront.

1.03 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Air Barrier seal doors, windows, curtainwall and storefront.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Air barrier seal door frames.

C. Section 08 43 13 - Aluminum-Framed Storefronts: Air barrier seal door and window frames.

D. Section 08 80 00 - Glazing: Air barrier seal frames: Air barrier seal window frames.

1.04 REFERENCE STANDARDS

A. ASTM C 920 - 11 Standard Specification for Elastomeric Joint Sealants.

B. ASTM D 412 - 06ae2 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

C. ASTM E 96 / E96M - 10 Standard Test Methods for Water Vapor Transmission of Materials.

D. ASTM E 283 - 04 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

E. ASTM E 547 - 00(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.

F. ASTM E 330 - 02(2010) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

G. ASTM E 331 - 00(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Showing Engineered Transition Assembly (ETA)

C. Test Reports: Indicate compatibility with materials, including glazing, framing, sealants, and air barrier systems.

D. Product Data: Provide data on the ETA materials and manufacturer's installation instructions.

1.06 QUALITY ASSURANCE

A. Air Infiltration: Proglaze ETA shall meet the allowable air infiltration when tested in accordance with ASTM E 783.

B. Air Leakage: Proglaze ETA shall have no water leakage when tested in accordance with ASTM E 1105.

C. Location and gasket design of Proglaze ETA must be approved by the window, door and wall manufacturers prior to use. Custom extrusions may be required to span transitions at expansion joints. To ensure proper connections can be made effectively, the sequuence of installation must be reviewed prior to construction.

D. Adhesion Testing: Adhesion testing must be done on all adjointing substrates and components to ensure proper adhesion. Proglaze ETA may cover or come in contact with pre-applied sealants, gaskets, and tapes. Testing of test materials must be done to ensure the required bonding is achieved when in contact with components of this engineered transition assembly.

Testing may be done on-site and/or may be submitted to manufacturer's Technical Services Department.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Basis of Design: Proglaze Engineered Transition Assembly (ETA) as manufactured by Tremco, Inc. www.tremco.com.

2.02 MATERIALS

A. Engineered Transition Assemblies (ETA)
   1. Pre-engineered, finished aluminum and silicone materials used as a transition assembly. The system assembly is mechanically attached to the window assembly to assure a durable seal is achieved. The engineered transitions assembly is comprised of the following components:
      a. Silicone Rubber Sheet (SRE): Extruded, 40 durometer, translucent silicone, with a lock-in rubber dart.
      b. Silicone Rubber Corners (SRC): Pre-molded, 40 durometer, translucent silicone, with a lock in rubber dart.
      c. Silicone Sealants: Comply with ASTM C 920, single-component, neutral-curing silicone; Class 100/50, Grade NS, Use O. Product shall be: Spectrem 1 as manufactured by Tremco.
      d. Extruded Aluminum Attachment (EAA): Alodine finished, with pre-engineered race for receiving silicone lock-in rubber dart. Extrusion is supplied in 5 foot lengths with predrilled holes. Butyl Tape: 100% solid Polyisobutylene-cross linked butyl preformed sealant.

B. Accessories
   1. Silicone Sealant: Spectrem 1 Silicone Sealant.
   2. Metal screws to be installed every 12 inches or as recommended by manufacturer. Minimum size screw is a #10 x 3/4 inch PHT. Larger screws may be used, but must be approved by the window and/or wall manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut the Extruded Aluminum Adaptor to the appropriate length or combine lengths to span the window and/or wall frame's length.

C. Clean the window frame with the IPA two-cloth method where the adaptor will make contact.

D. Remove the release paper on the back of the adaptor and position the adaptor on the window and/or wall support member. The butyl tape will temporarily hold the adaptor in position until the screws are installed and will provide a secondary seal between the adaptor and window/wall frame, while sealing around the penetration made by the mechanical fastener.

E. Using the same IPA two-cloth method, make sure the adaptor is clean and dry prior to applying the sealant.

F. Install the screws a minimum of every 12" to mechanically affix the adaptor to the window and/or wall frame.

G. Prior to insertion of the Silicone Rubber Extrusion into the race of the adaptor, Spectrem 1 Silicone Sealant is applied in the race and between the adaptor and the window frame to ensure a firm, continuous seal.

H. The Silicone Rubber Extrusion is inserted into the adaptor's race. Once the SRE is inserted, the silicone sealant is further compressed against the adaptor, the window frame, and the SRE.

I. As the Spectrem 1 Silicone Sealant cures, this 3-point mechanical bond will permanently hold the Silicone Rubber Extrusion in position while sealing the edges of the adaptor to the window frame.

J. The adaptor is easily cut to length to surround the window and wall system. It does not need to be mitered or run past the metal frame's edge.

K. The length of the Silicone Rubber Extrusion is determined by subtracting 10" (5" from either end of the window unit). This length will allow a minimum of 1" overlap under the pre-molded corner. The molded corner's dart is set back from the edge 1.5" to allow for the overlap.

L. Prior to insertion of the gasket into the adaptor's race, Spectrem 1 Silicone Sealant is applied.

M. The Spectrem 1 Silicone Sealant adheres the Silicone Rubber Extrusion to the race while affixing the adaptor to the window and/or wall frame. The gasket is then inserted into the race, which holds it in place while the sealant is allowed to cure.

N. The lap joints are sealed next. The perimeter seal is done last to permanently bond the Silicone Rubber Extrusion to the ExoAir 110, 110LT or TWF Membrane.

O. NOTE: The surface of the air and vapor barrier membrane must be cleaned with the IPA two-cloth method where the Silicone Rubber Extrusion will be adhered with Spectrem 1 Silicone Sealant. On the ExoAir membranes, this may remove some of the printing. This is normal and may be a good indicator of an effective cleaning process. Residual asphalt from the reverse side of the ExoAir should be kept to a minimum to ensure a good bonding surface

END OF SECTION

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Factory fabricated sheet metal items, including flashings, counter-flashings, gutters, downspouts, and other items indicated on the drawings.

B. Precast concrete splash pads.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 1998.

B. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

C. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

D. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; Current Edition.

F. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

G. FM DS 1-49 - Perimeter Flashing: Factory Mutual Research Corporation; current edition.

H. FM DS 1-28 - Design Wind Loads; Factory Mutual Research Corporation; 2005.

I. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; 2010.

J. ANSI/SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems, LATEST EDITION.

1.04 SUBMITTALS

A. See Section 013000 (01300) - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details. Include the latest edition of prefabricated metal component manufacturer/supplier’s installer’s guide for factory fabricated metal perimeter systems.

C. Samples: Submit two samples in size illustrating metal finish color.

D. Sample copy of the roofing system manufacturer's inclusion addendum offering coverage of the factory fabricated metal perimeter systems.

1.05 QUALITY ASSURANCE

A. Install factory fabricated sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Submit a letter from the roofing membrane manufacturer confirming that the factory fabricated metal accessory systems furnished for the project are supplied or manufactured by the roofing/waterproofing membrane manufacturer and will be covered under the manufacturer’s full system warranty as indicated in Section 075400 Thermoplastic Membrane Roofing.

C. Agency Approvals: The proposed prefabricated metal component shall conform to the following requirements.

1. Provide Factory Mutual approval system for Windstorm Classification for Roof Perimeter Fascia Systems, Reference Section 075400 Thermoplastic Membrane Roofing for wind loading design criteria.
2. The roof perimeter fascia systems shall be certified through third party verification by the manufacturer/supplier to meet performance design criteria according to the most recent edition of ANSI/SPRI ES-1: Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems.

D. Manufacturer Requirements: Ensure that the prefabricated metal component manufacturer/supplier provides direct trained personnel to attend necessary job meetings, perform periodic inspections as necessary, and conducts a final inspection upon successful completion of the project.

E. Thermal Movements:
1. Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
2. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

F. Water Infiltration:
1. Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

C. Deliver materials in the manufacturer's original packaging.

PART 2 PRODUCTS

2.01 PREFABRICATED MATERIALS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Prefabricated Roof Edge: Prefabricated roof edge components shall be factory formed according to the requirements of the membrane manufacturer. The roof edge system shall consist of the following minimum components:
1. A factory formed cant dam with pre-punched nail holes, fabricated from 24 gauge, G90 galvanized steel, having a height of 2 inches above roof level, secured using galvanized roofing nails.
2. A factory formed retainer cleat with pre-punched nail holes, fabricated from 20 gauge, G90 galvanized steel, secured using galvanized roofing nails.
3. A factory formed exterior fascia, fabricated from minimum 24 gauge galvanized steel, coated Kynar™finish.
4. Factory formed concealed splice plates, welded miters and end caps.

C. Prefabricated Coping Cap
1. Basis of Design: Rapid-Lok Ultra Coping as manufactured by Atas International.
a. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
1) Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.

2) Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 RE-3 to positive and negative design wind pressure as defined by applicable code.
3) Material: Formed aluminum sheet, 0.050 inch thick, minimum.
4) Finish: 70 percent polyvinylidene fluoride.
5) Color: To be selected by Architect Engineer from manufacturer's standard range.
6) Other Acceptable Manufacturers, provided they meet the specifications:
   (a) W.P. Hickman Company: www.wph.com.
   (b) Metal Era Coping Systems; http://www.metalera.com/.

b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: Polyethylene, 6 mils.

C. Slip Sheet: Rosin sized building paper.

D. Primer: Zinc chromate type.

E. Protective Backing Paint: Zinc molybdate alkyd.

F. Sealant: Type as specified in Section 079005 (07900).

G. Plastic Cement: ASTM D 4586, Type I.

2.03 GUTTER AND DOWNSPOUT FABRICATION

A. Fabricate gutters to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by NRCA and SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors. Scuppers, Gutter and Downspouts are to meet requirements of SMACNA (ASMM),Architectural Sheet Metal Manuals and NRCA, Architectural Sheet Metal Manual

B. Gutters and Downspouts: Size and profile indicated.

C. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements.

D. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

E. Seal metal joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Secure gutters and downspouts in place using concealed fasteners.

F. Slope gutters 1/4 inch per foot minimum.

G. Set splash pads under downspouts.

H. Perimeter Nailers: Perimeter nailers shall be flat and level to the building perimeter edge. The front edge of the nailer must be flush with the outside face or wall of the building. Anchor all perimeter nailers in strict accordance with the guidelines set forth in FM Global Property Loss Prevention Data Sheet 1-49.

I. Curbs for Expansion Joint Components: Curbs must be straight, level, and properly anchored to the building structural deck. Any curbs, which are improperly installed or anchored, must be corrected prior to installation of the expansion joint systems.

J. Flashing Membrane Installation: Ensure that all roofing/waterproofing flashing treatments used in conjunction with factory fabricated metal components are installed according to the roofing/waterproofing membrane manufacturer's specifications, current technical guide, and details prior to installation of the factory fabricated metal component.

K. Surface Cleaning: Sweep or vacuum all surfaces to receive the metal components, removing all loose aggregate, soil, and foreign substances prior to installation of the factory fabricated metal components.

3.04 PREFABRICATED METAL COMPONENT INSTALLATION

A. Install metal components in accordance with the roofing manufacturer's instructions and the following requirements.

B. Prefabricated Roof Edge
   1. Beginning at the corners, install the factory fabricated cant dam over the base ply of roof membrane, securing it to the perimeter nailer in accordance with the raised roof edge system manufacturer's installation instructions.
   2. After completion of the installation of the roofing/waterproofing flashing membrane plies over the cant dam, Place the retainer cleat over the finished flashing membrane firmly, without forcing. The retainer cleat shall be level and the nailing slots shall align centered with the nailer underneath the membrane/cant dam assembly. Fasten the retaining cleat in accordance with the raised roof edge system manufacturer's installation instructions.
   3. Beginning again at the corners, install the exterior fascia by setting it onto the retainer cleat and firmly pushing down until the fascia snaps over the front and back of the retainer cleat. Slide a concealed joint splice plate halfway into the fascia to allow the next section to fit halfway over the joint splice plate as well. Allow a 1/8 inch gap between raised roof edge sections for thermal movement. Increase the gap to 1/4 inch when installing in temperature below 40°F.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 81 00 - Applied Fireproofing.

1.04 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

C. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2014.

D. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

F. ITS (DIR) - Directory of Listed Products; current edition.

G. FM 4991 - Approval Standard for Firestop Contractors; 2013.

H. FM (AG) - FM Approval Guide; current edition.

I. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

J. UL (FRD) - Fire Resistance Directory; current edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Certificate from authority having jurisdiction indicating approval of materials used.

G. Installer Qualification: Submit qualification statements for installing mechanics.

1.06 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:.
   2. With minimum 3 years documented experience installing work of this type.
   3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
   4. Licensed by authority having jurisdiction.

1.07 MOCK-UP

A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.

B. Obtain approval of authorities having jurisdiction (AHJ) before proceeding.

C. If accepted, mock-up will represent minimum standard for the Work.

D. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.08 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING - GENERAL REQUIREMENTS

A. Firestopping: Any material meeting requirements.

B. Materials: Use any material meeting requirements.

C. Firestopping Materials with Volatile Content: Provide only products having lower volatile organic compound (VOC) content than required by SCAQMD 1168.

D. Mold Resistance: Provide firestoppping materials with mold and mildew resistance rating of 0 as determined by ASTM G21.

E. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Type required for tested assembly design.

F. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use any system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814 or ASTM E119 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

A. Independent Testing Agency: Inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, “Standard Practice for On-Site Inspection of Installed Fire Stops and ASTM E2393, “Standard Practice for On-Site Inspection of Installed Fire Stop Joint Systems.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 92 00
JOINT SEALERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.03 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

B. Section 07 84 00 - Firestopping: Firestopping sealants.

C. Section 07 95 13 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

D. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.

E. Section 08 80 00 - Glazing: Glazing sealants and accessories.

F. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

G. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.04 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2014.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).

F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.

G. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required.
6. Substrates for which laboratory adhesion and/or compatibility testing is required.
7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
8. Sample product warranty.
9. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect Engineer and submit at least two physical samples for verification of color of each required sealant.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   2. Bostik Inc: www.bostik-us.com.
   3. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/sle.
   4. Pecora Corporation: www.pecora.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
   1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
   2. Bostik Inc: www.bostik-us.com.
   3. Pecora Corporation: www.pecora.com.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on the drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
      e. Other joints indicated below.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
         1) Exception: Such gaps and openings in gypsum board finished stud walls and suspended ceilings.

c. Other joints indicated below.

3. Do not seal the following types of joints.
   a. Intentional weepholes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
   2. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
   3. Floor Joints in Wet Areas: Nonsag polyurethane "nontraffic-grade" sealant suitable for continuous liquid immersion.
   4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
   5. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors for Flooring: Match adjacent concrete floorings.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.
   5. Cure Type: Single-component, neutral moisture curing.

B. Type Bathtub/Tile Sealant - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.

C. Type General Purpose Exterior - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: Match adjacent finished surfaces.

D. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multicomponent; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
   1. Movement Capability: Plus and minus 35 percent, minimum.

E. Type General Purpose Interior Sealant - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
   1. Color: Standard colors matching finished surfaces, Type OP (opaque).

F. Type ___ - Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

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SECTION 07 95 13

EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, and ceiling surfaces.

1.03 RELATED REQUIREMENTS

A. Section 04 27 31 - Reinforced Unit Masonry: Placement of joint cover assembly frames in masonry.

B. Section 07 92 00 - Joint Sealers: Sealing expansion and control joints using gunnable and pourable sealants.

C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board control joint trim.

D. Section 09 51 00 - Suspended Acoustical Ceilings: Expansion joint assemblies in suspended ceiling grids.

1.04 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2010.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, effected adjacent construction and anchorage locations.

D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Expansion Joint Cover Assemblies:
1. Construction Specialties, Inc: www.c-sgroup.com.
2. Inpro; _____: www.inprocorp.com.
3. MM Systems Corp: www.mmsystemscorp.com.
4. Metal-Era Perma-Tite
5. Nystrom, Inc: www.nystrom.com.
6. Johns Manville.
7. Joint Master

8. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Seismic Movement:
   1. Products:
      a. Basis of Design: Construction Specialties: Model RFA.

B. Interior Wall/Ceiling Joints Subject to Thermal Movement:
   1. Products:
      a. Basis of Design: Construction Specialties: Model ASM/ASMC.
      b. Basis of Design for Lay-In Ceilings: Joint Master: Model 821.

C. Interior Non-Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:
   1. Products:
      a. Basis of Design: Construction Specialties: Model ASM/ASMC.
      b. Basis of Design for Lay-In Ceilings: Joint Master: Model 821.

D. Exterior Wall Joints Subject to Thermal Movement:
   1. Products:
      a. Basis of Design: Johns Manville: Expand-O-Flash .
      b. Basis of Design for Exposed Conditions: Construction Specialties: ASM-X/ASMC-X.

E. Exterior Wall Joints Subject to Seismic Movement:
   1. Products:
      a. Basis of Design: Johns Manville: Expand-O-Flash .
      b. Basis of Design for Exposed Conditions: Construction Specialties: ASM-X/ASMC-X.

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Dimensions and Configurations: As indicated on drawings.
   2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   3. Joint Cover Styles: As indicated on drawings.
   4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.
   1. If floor covering is not indicated, obtain instructions from Architect Engineer before proceeding.
   2. If style is not indicated, provide extruded aluminum frame both sides, resilient seals, and minimize exposed metal.

C. Covers In Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

D. Covers In Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
   1. Acceptable Evaluation Agencies: UL, ULC, and Intertek.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
   1. Exposed Finish Outdoors: Natural anodized.
   2. Exposed Finish at Floors: Natural anodized.
   3. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Anchors and Fasteners: As recommended by cover manufacturer.

C. Expansion Joint Filler for Masonry walls where indicated. Non-compressed closed cell ethylene vinyl acetate foam with tensile strength of 120 psi, according to ASTM D3575.

D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

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SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Tornado resistant hollow metal doors and frames.

F. Hollow metal borrowed lites glazing frames.

1.03 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

C. Section 09 91 13 - Exterior Painting: Field painting.

1.04 REFERENCE STANDARDS

A. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms; 2015.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

G. FEMA P-361 - Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms; 2015.

H. FLA (PAD) - Florida Building Code Online - Product Approval Directory; database at www.floridabuilding.org.

I. ICC 500 - ICC/NSSA Standard for the Design and Construction of Storm Shelters; National Storm Shelter Association; 2014.

J. FEMA 361 - Design & Construction Guidance for Community Shelters

K. ITS (DIR) - Directory of Listed Products; current edition.

L. Miami (APD) - Approved Products Directory; Miami-Dade County; database at www.miamidade.gov/development/product-control.asp.

M. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

N. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

O. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

P. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

Q. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 inch by 2 inch in size showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes installation requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 DESIGN CRITERIA

A. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory finished.

B. Exterior Doors: Thermally insulated.
1. Grade: ANSI A250.8 - SDI-100; Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inch, nominal.

C. Interior Doors, Non-Fire Rated:
1. Grade: ANSI A250.8 - SDI-100; Level 2 - Heavy-Duty, Physical Performance Level B, Model 2 - Seamless.
2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inch, nominal.

D. Fire-Rated Doors:

1. Grade: ANSI A250.8 - SDI-100; Level 2 - Heavy-Duty, Physical Performance Level B, Model 2 - Seamless.
2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   b. Attach fire rating label to each fire rated unit.
3. Thickness: 1-3/4 inch.

E. Tornado Resistant Doors:
1. Basis of Design: Model 361 Stormpro Storm Door, as manufactured by Assa Abloy.
2. Design and size door and frame components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M.
   a. Design Wind Loads: Comply with requirements of authorities having jurisdiction (AHJ).
   b. Wind-Borne Debris Resistance: Door and frame components shall have FLA (PAD) approval, Miami (APD) approval, or UL (DIR) approval for Large and Small Missile impact and pressure cycling at design wind loads.
3. Tornado Shelter Application: Comply with ICC 500 standard.
   a. Commercial: Designed and tested to comply with Federal Emergency Management Agency (FEMA) FEMA P-361 community shelter door assembly guidelines.
4. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
   a. Level 4 - Maximum-duty.
   b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
   c. Model 1 - Full Flush.
   d. Door Face Metal Thickness: 14 gage, 0.067 inch, minimum.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. General:
1. Comply with the requirements of grade specified for corresponding door, except:
   a. ANSI A250.8 - SDI-100, Level 1 and 2 Door Frames: 16 gage, 0.053 inch, minimum thickness.
   b. ANSI A250.8 - SDI-100, Level 3 Door Frames: 14 gage, 0.067 inch, minimum thickness.
   c. ANSI A250.8 - SDI-100, Level 4 Door Frames: 12 gage, 0.093 inch, minimum thickness.
   d. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 - SDI-100, Level 1, 16 gage, 0.053 inch
2. Finish: Same as for door.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

C. Exterior Door Frames: Face welded.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Weatherstripping: Separate, see Section 08 71 00.

D. Interior Door Frames, Non-Fire Rated: Face welded type.
1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.

E. Door Frames, Fire-Rated: Face welded type.

1. Fire Rating: Same as door, labeled.

F. Tornado Resistant Door Frames: With same tornado resistance as door; face welded or full profile/continuously welded construction, ground smooth, fully prepared and reinforced for hardware installation.

G. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 ACCESSORIES

A. Glazing: As specified in Section 08 80 00, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Astragals for Double Doors: Specified in Section 08 71 00.
1. Exterior Doors: Steel, Z-shaped.
2. Fire-Rated Doors: Steel, shape as required for fire rating.

D. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

F. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames. Protect concrete floor to prevent rust staining.

2.06 FINISHES

A. Factory Finish: Complying with ANSI A250.3, baked enamel will be acceptable.
1. Color: As scheduled.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. Install fire rated units in accordance with NFPA 80.

C. In addition, install FEMA 361 door assemblies in compliance with FEMA 361 standard.

D. Coordinate frame anchor placement with wall construction.

E. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

F. Coordinate installation of hardware.

G. Coordinate installation of glazing.

H. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

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SECTION 08 14 16
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated, non-rated, acoustical, and special function.

1.03 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 80 00 - Glazing.

1.04 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

B. ASTM E413 - Classification for Rating Sound Insulation; 2010.

C. ITS (DIR) - Directory of Listed Products; current edition.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

E. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

F. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

G. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

H. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts required, special beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Specimen warranty.

E. Test Reports: Show compliance with specified requirements for the following:
   1. Sound-retardant doors and frames; sealed panel tests are not acceptable.

F. Samples: Submit two samples of door construction, cut from top corner of door.

G. Samples: Submit two samples of door veneer, illustrating wood grain, stain color, and sheen.

H. Manufacturer's Installation Instructions: Indicate special installation instructions.

1.06 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer. Break seal on site to permit ventilation.

1.08 PROJECT CONDITIONS

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors: Design is based on Graham Wood Doors.
   1. VT Doors: www.vtindustries.com.
   2. Eggers Industries: www.eggersindustries.com.
   3. Marshfield DoorSystems, Inc: www.marshfielddoors.com.
   4. Algoma: www.algomahardwoods.com.
   5. Oshkosh: www.oshkoshdoor.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS

A. All Doors: See drawings for locations and additional requirements.
   1. Quality Level: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated. Veneer thickness shall not be less 1/50 inch.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire-Rated Doors: Tested to 20 minutes, 60 minutes, 90 minutes, and ratings as indicated on drawings in accordance with UL 10C - Positive Pressure; UL (DIR) or ITS (DIR) labeled without any visible seals when door is open.
   3. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
   4. Sound Retardant Doors: Minimum STC as indicated on drawings, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
   5. Wood veneer facing with factory transparent finish .

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type staved lumber core (SLC) or formaldahyde free particleboard core (PC), plies and faces as indicated.

B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

C. Sound Resistant Doors: Equivalent to Type particleboard core (PC) construction with core as required to achieve STC rating specified; plies and faces as indicated. Cross-banded composite sound core - STC-45 with acoustical gasketing and door bottom. View glass 6" x 36" with 5/8" laminated glazing as specified in Section 08 81 00 Glazing.

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Cherry, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face; unless otherwise indicated.
   1. Vertical Edges: Same species as face veneer.
   2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Fit door edge trim to edge of stiles after applying veneer facing.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 FACTORY FINISHING - WOOD VENEER DOORS

A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
   1. Transparent:
      a. System - TR-8, UV Cured Acrylated Polyester/Urethane.
      b. Stain: As selected by Architect Engineer.
      c. Sheen: Flat.

B. Factory finish doors in accordance with approved sample. See Finish Schedule for stain color.

C. Seal door top edge with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: As specified in Section 08 11 13.

B. Glazing: As specified in Section 08 80 00.

C. Astragals for Non-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge.

D. Astragals for Fire-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

E. Manufacturer to provide butts and gasketing as needed for sound rated doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Ceiling access door and frame units.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; current edition.

B. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acudor Products Inc: www.acudor.com.

B. Karp Associates, Inc: www.karpinc.com.

C. Milcor Inc: www.milcorinc.com.

D. Substitutions: See Section 01600 (01 6000) - Product Requirements.

2.02 ACCESS DOOR AND PANEL APPLICATIONS

A. Ceilings, Unless Otherwise Indicated:
   1. Size in Lay-in Grid Ceilings: To match grid module.

2.03 WALL AND CEILING UNITS

A. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies that units are to be installed in.
   1. Material: Steel.
   2. Style: Exposed frame with door surface flush with frame surface.
   3. Door Style: Single thickness with rolled or turned in edges.
   4. Frames: 16 gage, 0.0598 inch, minimum.
   5. Heavy Duty Frames: 14 gage, 0.0747 inch, minimum.
   6. Steel Finish: Factory primed for field painting.
   7. Hardware:
      a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
      b. Handle: Fixed.
      c. Latch/Lock: Screw driver slot for quarter turn cam latch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 08 33 13
COILING COUNTER DOORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Non-fire-rated coiling counter doors, manually operated.

1.03 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Support framing and framed openings.

B. Section 06 10 00 - Rough Carpentry: Rough openings.

C. Section 07 92 00 - Joint Sealers: Sealing joints between frames and adjacent construction.

D. Section 08 71 00 - Door Hardware: Cylinder cores and keys.

E. Division 26: Wiring Connections: Power to disconnect.

1.04 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Submit two slats, 4 inch long, illustrating shape, color and finish texture.

E. Manufacturer's Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.08 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.09 COORDINATION

A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

1.10 WARRANTY

A. Manufacturer’s 2 year limited warranty for PowderGuard Premium Powder Coat Finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Coiling Counter Doors:
   1. Basis of Design: Overhead Coiling Counter Doors, as manufactured by Overhead Door Corp.; www.overheaddoor.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Aluminum Counter Doors: Basis of Design - Anodized Aluminum Counter Door, Series 656 as manufactured by Overhead Door Corporation.
   1. Wall Mounting Condition:
      a. Face-of-wall mounting.
   2. Curtain: Interlocking clear anodized aluminum slats with endlock for curtain alignment. Slats, 0.051 inch (1.3 mm) thick, and extruded aluminum bottom bar with lift handle, concealed slide bolts and vinyl astragal.
   3. Integral Frame and Sill: Integral steel frame and stainless steel sill. Frame consists of 16 gauge jambs and header, with 14 gauge sill.
   4. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch (0.8 mm) per foot of span. Counterbalance shall be adjustable by means of an adjusting tension wheel.
   5. Hood: Steel primed with intermediate support brackets as required.
   6. Operation:
      a. Manual push up.
   7. Locking:
      a. Recessed slide bolt.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

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SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling doors and shutters, operating hardware, fire-rated, non-fire-rated, and exterior, manual and electric operation.

B. Wiring from electric circuit disconnect to operator to control station.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Cylinder cores and keys.

B. Section 26 27 17 - Equipment Wiring: Power to disconnect.

C. Section 28 31 00 - Fire Detection and Alarm: Fire alarm interconnection.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

B. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; National Electrical Manufacturers Association; 2000 (R2005), with errata, 2008.

E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

F. UL (DIR) - Online Certifications Directory; Underwriters Laboratories Inc.; current listings at database.ul.com.

G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

D. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

1.05 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Doors:
   1. Alpine Overhead Doors, Inc; _____: www.alpinedoors.com.
   2. Cornell Iron Works, Inc; _____: www.cornelliron.com.
   3. Overhead Door Corporation.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Overhead Coiling Fire Doors:
   1. Alpine Overhead Doors, Inc; _____: www.alpinedoors.com.
   2. Cornell Iron Works, Inc; _____: www.cornelliron.com.

3. Overhead Door Corporation.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain.
   1. Capable of withstanding positive and negative wind loads of 20 psf, without undue deflection or damage to components.
   2. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.1.
   3. Nominal Slat Size: 2 inches wide x required length.
   4. Finish: Factory painted, color as selected.
   5. Guides: Angles; galvanized steel.
   6. Hood Enclosure: Manufacturer's standard; primed steel.
   7. Electric operation.
   8. Mounting: As indicated on drawings.
   9. Locking Devices: Slide bolt on inside.

B. Non-Fire-Rated Interior Coiling Doors: Steel slat curtain.
   1. Nominal Slat Size: 2 inches wide x required length.
   2. Finish: Factory painted, color as selected.
   3. Guides: Angles; primed steel.
   4. Hood Enclosure: Manufacturer's standard; primed steel.
   5. Electric operation.
   6. Mounting: As indicated on drawings.
   7. Locking Devices: Slide bolt on inside.

C. Fire-Rated Coiling Doors: Steel slat curtain; conform to NFPA 80.
   1. 1-1/2 hour fire rating.
   2. Provide products listed and labeled by ITS (DIR) or UL (DIR) as suitable for the purpose specified and indicated.
   3. Oversized Openings: Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated units and operating hardware assembly.
   4. Finish: Factory painted, color as selected.
   5. Guides: Angles; primed steel.
   6. Hood Enclosure: Manufacturer's standard; primed steel.
   7. Coiling Door Release Mechanism: Fire alarm system activated with automatically governed closing speed.
   8. Electric operation.
   9. Mounting: Within framed opening.

2.03 MATERIALS

A. Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.

B. Steel Slats: Minimum thickness, 24 gage, ___ inch; ASTM A653/A653M galvanized steel sheet.
   1. Galvanizing: Minimum G90/Z275 coating.

C. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

D. Hood Enclosure: Internally reinforced to maintain rigidity and shape.

E. Lock Hardware:
   1. Cylindrical Locking Mechanism: Latchset lock cylinder, specified in Section 08 71 00.

2. For motor operated units, additional lock or latching mechanisms are not required.
3. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

F. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.

2.04 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
1. Provide interlock switches on motor operated units.

B. Electric Operators:
1. Motor Rating: 1/3 hp; continuous duty.
2. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
3. Controller Enclosure: NEMA 250, Type 1.
4. Opening Speed: 12 inches per second.
5. Brake: Adjustable friction clutch type, activated by motor controller.
6. Manual override in case of power failure.

C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
1. 24 volt circuit.

D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes, tolerances and conditions are acceptable.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install fire-rated doors in accordance with NFPA 80.

C. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

D. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

E. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

F. Coordinate installation of electrical service with Section 26 27 17.

G. Complete wiring from disconnect to unit components.

H. Complete wiring from fire alarm system.

3.03 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.04 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

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SECTION 08 43 13
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors .

C. Weatherstripping.

D. Door hardware.

1.03 RELATED REQUIREMENTS

A. Section 05 12 00 - Structural Steel: Steel attachment members

B. Section 05 50 00 - Metal Fabrications: Steel attachment devices.

C. Section 07 25 00 - Weather Barriers: Sealing framing to weather barrier installed on adjacent construction.

D. Section 07 90 05 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 08 71 00 - Door Hardware: Key cylinders and hardware items other than specified in this section.

F. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.04 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; 2009.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

G. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

H. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

I. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.06 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.

1. Design Wind Loads: Comply with requirements of ASCE 7.
2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.

B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.

D. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.

E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

F. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details .

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples illustrating finished aluminum surface, glass, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

H. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.08 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at the State of Arkansas.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.10 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Basis of Design: Kawneer Company, Inc.; TriFab 451T, Aluminum-Framed Storefront and Doors, and Interiors 450, as indicated on Drawings.

C. Other acceptable manufacturers:
   1. C.R. Laurence Company, Inc; U.S. Aluminum: www.crl-arch.com/sle.
   2. Oldcastle BuildingEnvelope: www.oldcastlebe.com.
   3. Tubelite, Inc.: www.tubeliteinc.com.
   4. United States Aluminum Corp: www.usalum.com.
   5. YKK AP America Inc.: www.ykkap.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.
   3. Cross-Section: As indicated on drawings.
   4. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

B. Glazing: As specified in Section 08 80 00.

C. Doors: Glazed aluminum. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 3-3/16 to 3-1/2 inches wide.
   3. Vertical Stiles: 3-1/2 inches wide.
   4. Bottom Rail: 6-1/2 inches wide.
   5. Glazing Stops: Beveled.
   6. Finish: Same as storefront.
   7. Manufacturer: Same as storefront.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Fasteners: Stainless steel.

E. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.

F. Concealed Flashings: Galvanized steel, 26 gage, 0.0179 inch minimum base metal thickness.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08 80 00.

I. Perimeter Sealant: Type specified in Section 07 92 00 Joint Sealants.

J. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

K. Glass: As specified in Section 08 80 00 and as follows:
   1. Glass in Exterior Framing: Type Low-e.
   2. Glass in Interior Framing: Type tempered.
   3. Glass in Doors: Type tempered.

L. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

M. End of Partition at storefront: Provide; Mull-it-Over; www.mullitoverproducts.com. Match finish of framing, where indicated.

2.04 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

B. Color: Clear.

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.05 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: Storefront manufacturer's standard type to suit application.
   1. Finish on Hand-Contacted Items: Polished stainless steel.
   2. For each door, include butt hinges, pivots, push handle, pull handle, exit device, narrow stile handle latch, and closer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Do not anchor to the back of sub sill.

H. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

I. Coordinate attachment and seal of perimeter air and vapor barrier materials.

J. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

K. Set thresholds in bed of sealant and secure.

L. Install hardware using templates provided.

M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

B. Test installed storefront for water leakage in accordance with AAMA 501.2 hose test.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Remove excess sealant by method acceptable to sealant manufacturer.

3.07 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

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SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware.
   2. Cylinders for doors specified in other Sections.
   3. Electrified door hardware.

B. See Division 08 door sections for astragals and door silencers.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each type of product indicated.

C. Shop Drawings: Details of electrified door hardware, including wiring diagrams.

D. Other Actions Submittals:
   1. Door Hardware Sets: Prepared by or under supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams.
      a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Document.
      b. Content: Include the following information:
         1) Identification number, location, hand, fire rating and material of each door and frame.
         2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
         3) Complete designations of every item required for each door or opening including name and manufacturer.
         4) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
   2. Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks.

1.03 QUALITY ASSURANCE

A. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

B. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electric modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

C. Fire-Rated Door Assemblies: Assemblies complying with NEPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 251 and 252.

D. Keying Conference: The supplier shall prepare a recommended keying schedule and include it in the hardware schedule for approval. Following approval, the supplier shall establish a meeting with the Owner or Owner's representative to review and gain approval of the final keying system. Confirmation of the meeting and attendees shall be given to the general Contractor in writing and four (4) final copies of the hardware schedule containing keying revisions shall be submitted to the general Contractor for his files and field use.

E. Owner's Maintenance Package: The hardware supplier shall prepare a packet containing a complete up to date copy of the hardware schedule, two copies of any installation and or

maintenance instructions for items provided on the project and two sets of installation and adjustment tools, including dogging keys and emergency keys for any hardware requiring these tools. The maintenance package is to be delivered to the General Contractor with the key control systems and the master keys.

1.04 DELIVERY, STORAGE AND HANDLING

A. Deliver keys to Coordinator by registered mail or overnight package service.

1.05 COORDINATION

A. Templates: Distribute door hardware template information for doors, frames, and other work specified to be factory prepared for installing door hardware.

1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period.
   1. Warranty Period: One (1) year from date of Substantial Completion, except as follows:
      a. Manual Closers: Ten (10) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule and door hardware sets indicated in Part 3 paragraphs "Door and Hardware Sets."
   1. Door hardware sets: Provide quantity, item, size, finish and color indicated products equivalent in function and comparable in quality to names products except as noted.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 paragraphs "Door and Hardware Sets." Products are identified by using door hardware designations, as follows:
   1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturer's names are abbreviated in Part 3 paragraphs "Door and Hardware Sets."
   2. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturer's names are abbreviated in Part 3 paragraphs "Door and Hardware Sets."
   3. (S) Stanley Security Solutions, Indianapolis, Indiana
   4. (B) Best Access Systems, Indianapolis, Indiana
   5. (P) Precision Hardware, Indianapolis, Indiana
   6. (T) Trimco, Los Angeles, California
   7. (NG) National Guard Products, Memphis, Tennessee
   8. (SC) Schlage Lock Co., Colorado Springs, Colorado
   9. (AB) ABH Manufacturing, Elk Grove Village, Illinois
   10. (L) Lund Equipment Company, Bath, Ohio

2.02 HINGES, GENERAL

A. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Hinge Base Metal: Unless otherwise indicated, provide the following.
   1. Exterior Hinges: Brass, with stainless-steel pin body and brass protruding heads.
   2. Interior Hinges: Steel with steel pin.
   3. Hinges for Fire-Rated Assemblies: Steel with steel pin.

C. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors.

D. Fasteners: Comply with the following:
   1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.

2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-head wood screws: For fire-rated wood doors.
4. Screws: Phillips flat-head, machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

E. Butt hinges are to be the type and weights indicated. Sizes are to be in accordance with the following:
1. Thickness:
a. 1-3/4 Inches Thick Doors: 4-1/2 Inches.
b. 1-3/8 Inches Thick Doors: 3-1/2 Inches.
2. Width:
a. Doors up to 42 Inches Wide: 4-1/2 Inches.
b. Doors 42 Inches Wide and Over: 5 Inches.

F. Quantity: Provide the following unless otherwise indicated.
1. Two Hinges: for doors with heights up to 60 inches.
2. Three Hinges: for doors with heights 61 to 90 inches.
3. Four Hinges: for doors with heights 91 to 120 inches.

2.03 HINGES

A. Butts and Hinges: BHMA A156.1

B. Template Hinge Dimensions: BHMA A156.7

C. Acceptable Manufacturers:
1. Bommer Industries, Inc. (B)
2. Hager Companies (H)
3. McKinney Products Company, an ASSA ABLOY Group Company (Mc)
4. PBB, Inc. (P)
5. H.B. Ives (I)

2.04 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Locks are to be Best 93K series cylindrical locks conforming to ANSI A156.1 series 4000 Grade 1 and federal specifications series 161. Latch bolts are to have full ¾” throw of the mechanical anti-friction type. Deadlocks are to have a full 1” throw with hardened steel inserts.

D. Lock Trim:
1. Levers: Best 14D

E. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors.

F. Backset: 2-3/4 inches, unless otherwise indicated.

G. Strikes: Manufacturer’s standard strike with strike box for each latch bolt or lock bolt, with lip sized to meet conditions, finished to match door hardware set.

H. Lock Functions: Function numbers and descriptions are indicated in door hardware sets.

I. Acceptable Manufacturers:
1. Schlage, Sargent

2.05 AUXILIARY LOCKS AND LATCHES

A. Auxiliary Locks: Best 48H

B. Acceptable Manufacturers:
1. Schlage, Sargent

2.06 DOOR BOLTS

A. Bolt Throw: Comply with testing requirements for length of bolts required for labeled fire doors.

B. Manual Flush Bolts:
   1. Acceptable Manufacturers:
      a. Door Controls International (DC)
      b. Hager Companies (H)
      c. H.B. Ives, (I)
      d. Rockwood Manufacturing (R)

2.07 EXIT DEVICES:

A. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Exit Devices: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Panic Exit Devices: Listed and labeled by a test and inspecting agency acceptable to authorities having jurisdiction for panic protection based on testing according to UL 305. Devices used on fire doors are to be UL listed for use on fire doors.

D. Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire and panic protection based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

E. Outside Trim: Lever with cylinder: Material and finish to match locksets unless otherwise indicated.
   1. Match design for locksets and latch sets unless otherwise indicated.

F. Through Bolts: For exit devices and trim on all doors.

G. Acceptable Manufacturers:
   1. Corbin Russwin (CR)
   2. Von Duprin (V)
   3. Substitutions: Not permitted.

2.08 KEYING

A. All locks are subject to a new Grand Master key system.

B. All locks are to have seven (7) pin interchangeable cores incorporating a patented key system equal to Best Coremax X-series.

C. Furnish four (4) keys per keyed alike group and two (2) keys each for all other locks.

D. Provide ten (10) construction keys and four (4) construction control keys.

E. Provide all exterior doors and twenty per cent of interior doors with construction cores.

F. Furnish four (4) grand master keys and six (6) master keys for each group.

G. A representative of the permanent cores is to be by the general contractor. Construction cores are to be returned to the supplier.

H. Provide two hundred (200) key blanks.

2.09 OPERATING TRIM

A. Door Pulls:
   1. Size: Minimum 1 inch diameter, 10 inches center to center length.
   2. Material: Brass, Bronze or Stainless Steel.
   3. Provide thru-bolt mounting.
   4. Basis of Design Product: Model #1191-3 X BP4 manufactured by Trimco.

B. Push Plates:
   1. Size: 8 inches x 16 inches.

2. Where doors have obstructions allowing less than 8 inches stiles, provide 4 inches by 16 inches plates.
3. Basis of Design Product: Model #1001-11 and Model #1001-3 manufactured by Trimco.

C. Acceptable Manufacturers:
1. Hager Companies (H)
2. H.B. Ives Hardware, (I)
3. Rockwood Manufacturing Company (R)
4. Burns Manufacturing (B)

2.10 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
1. Comply with the following maximum opening-force requirements:
a. Interior, Non-Fire Rated Hinged Doors: 5 lbf applied perpendicular to door.
b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Mean of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Surface Closers: Provide streamlined style with full covers and integral back check feature with an adjustable valve. Provide parallel arm brackets for all exterior out swinging doors and where required for closer to be located on non-public side of door, and as required by adjacent wall conditions, unless otherwise indicated.
1. Provide closer withhold-open arms except where used in conjunction with UL rated doors or electric access control.
2. Provide cushion stop arms in the hardware sets as indicated (CS).

D. Certified Products: Provide door closers listed in BHMA's "directory of Certified Door Closers."

E. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendation for size of door closers, and anticipated frequency of use. Provide size adjustable closers, adjustable to meet field conditions and requires for opening force.

F. Basis of Design Product: D4551 as manufactured by Stanley.
1. Products of the following manufacturer will be considered acceptable provided they are of equivalent weight, function and design.
a. LCN
b. Sargent
c. Corbin Russwin

2.11 PROTECTIVE TRIM UNITS

A. Provide protection plates sized 1-1/2 inches less than door width for single door and 1 inch less than door width for pairs of doors, and by the following heights:
1. Armor Plates: 40 inches.
2. Kick Plates: 10 inches.

B. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:
1. Material: 0.050 inch thick stainless steel.
2. Material: Trimco.
3. Acceptable manufacturers:
a. Hager Companies (H)
b. H.B. Ives (I)
c. Rockwood Manufacturing Company (R)
d. Burns (B)

2.12 STOPS AND HOLDERS

A. Furnish wall mounted door stops where ever possible. Where wall stops are not practical, provide floor or base stops.

B. Exterior doors are to have Trimco 1205 or 7281 stops.

C. Interior doors are to receive Trimco 1270WX stops. Where floor stops are necessary, provide Trimco 7280. Where wall stops engage knobs with push buttons, provide Trimco 1270WV stops.

D. Provide fasteners of the proper type for the wall and floor materials.

E. Provide Trimco 1229A or 1229B silencers for each hollow metal or wood frame. Furnish three (3) silencers for each single opening and two (2) silencers for each double opening.

F. Silencers for Door Frames: Neoprene or rubber, fabricated for drilled-in application to frame.

G. Acceptable Manufacturers:
   1. Door Controls International (DC)
   2. Hager Companies (H)
   3. H.B. Ives Hardware, (I)
   4. Rockwood Manufacturing (R)
   5. Burns Manufacturing (B)

2.13 DOOR GASKETING

A. Standard: BHMA A156.22

B. General: Provide continuous weather-strip Gasketing on exterior doors and provide smoke light or sound Gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
   1. Perimeter Gasketing: Apply to head and jamb forming seal between door and frame.
   2. Meeting Stile Gasketing: Fasten to meeting stiles forming seal when doors are closed.
   3. Door Bottoms: Apply to bottom of door forming seal wit threshold when door is closed.

C. Smoke Labeled Gasketing: Assemblies comply with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for smoke-control ratings indicated based on testing according to UL 1784.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency for sound ratings indicated based on testing according to ASTM E 1408.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks by manufacturer.

F. Gasketing Materials: ASTM D 2000 and AAMA 701/702.

G. Acceptable Manufacturers:
   1. Hager Companies (H)
   2. Pemko Manufacturing Company (PEM)
   3. Reese Enterprises (RE)
   4. Zero International (ZRO)

2.14 THRESHOLDS

A. Accessibility Requirements: Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

B. Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 1/2 inch high.

C. Acceptable Manufacturers:
   1. Hager Companies (H)
   2. Pemko Manufacturing Company (PEM)
   3. Reese Enterprises (RE)
   4. Zero International (ZRO)

2.15 KEY CONTROL SYSTEM

A. Key Control Cabinet: Wall-Mounted metal cabinet with baked-enamel finish containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key gathering envelopes, and temporary and permanent markers with key capacity of 150 percent of the number of locks.

B. The supplier shall completely set up the key control system, tagging the file and loaner keys and placing them on the proper hooks. The supplier shall place any additional keys in the envelopes provided and mark them by the key symbol and appropriate hook. The three-way cross index of keys is to be completed in accordance with the latest hardware schedule and placed in the key cabinet. The key control system is to be delivered to the general Contractor with the Owner's maintenance package and the master keys if applicable.

2.16 FABRICATION

A. Base Metals: Produce door hardware units of base metals, fabricated by forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturers standard materials or forming methods if different from specified standard.

B. Fasteners: Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finish heads to match surface of door hardware, unless otherwise indicated.

C. Finishes:
   1. The finish in general shall be satin chrome (BHMA 626 or BHMA 652).
   2. Satin stainless steel (BHMA 630) may be provided at the supplier's option.
   3. Satin stainless steel (BHMA 630) shall be provided for high frequency doors.
   4. Door closers shall be painted aluminum (BHMA 689).
   5. Thresholds and weather-strips shall be mill finish aluminum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Steel Doors and Frames: Comply with DHI A115 Series. Drill and tap doors and frames for surface-applied door hardware according to ANSI A250.6.

B. Wood Doors: Comply with DHI A115-W Series.

C. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Door and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

D. Install each door hardware item to comply with manufacturers written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed or substrates involved.

E. Adjustment: The installer is to make adjustments as necessary to insure proper operation of all hardware items.
   1. Door Opening Force: In accordance with the Americans with Disabilities Act (ADA), adjust all door hardware so that the maximum force required for pushing or pulling open a door shall be as follows:
      a. Fire doors shall have a minimum opening force allowable by the appropriate administrative authority.
      b. Exterior hinged doors: 8.5 lbf.
      c. Interior hinged doors: 5.0 lbf.

2. Door Closers: If door is equipped with a closer, then the sweep period of the closer shall be adjusted so that from an open position to 70 degrees, the door will take at least 3 seconds to a point 3 inches from the latch, measured to the leading edge of the door.
3. The installer shall check the door closer adjustment after testing and balancing of the HVAC system and make any corrections as required. In addition, the door closers are to be checked six months after the final completion and adjusted as necessary.

3.02 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner may engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.03 DOOR HARDWARE SETS

A. The following is a general listing of the minimum hardware requirements. Any item of hardware normally required by good practice, or as to meet State and Local codes, shall be furnished even though it may not be specifically mentioned.

B. HW-1; Each pair to have:

1.	S	2	Hinges	662HD
2.	P	2	Panic Devices	2403
3.	P	1	Rem. Mullion	KR822
4.	Y	3	Cylinders	
5.	T	3	Pulls	
6.	S	2	Closers	
7.	T	2	Stops	
8.	NG	1	Threshold	425HD
9.	NG	2	Door Bottoms	200S
10.	NG	1	Set Gasketing	5075

C. HW-2; Each pair to have:

1.	S	2	Hinges	662HD
2.	T	2	Sets Push/Pull Bars	1737-BP-4 x (2) 1741-BP4 x Type N Mtg
3.	S	2	Closers	
4.	T	2	Stops	

D. HW-3; Each pair to have:

1.	S	2	Hinges	662HD
2.	P	2	Panic Devices	2108 x 4908D x SNB
3.	P	1	Rem. Mullion	KR822
4.	B	3	Cylinders	
5.	S	2	Closers	CS
6.	T	2	Kick Plates	
7.	T	2	Stops	
8.	NG	1	Threshold	425HD-RCE
9.	NG	2	Door Bottoms	200S
10.	NG	1	Set Gasketing	5075
11.	NG	1	Rain Drip	16 DW + 4”

E. HW-4; Each to have:

1.	S	1	Hinge	662HD
2.	B	1	Dead Lock	48H-K
3.	B	1	Lock	R
4.	S	1	Closer	CS
5.	T	1	Armor Plate	
6.	T	1	Stop	
7.	NG	1	Threshold	425HD-RCE
8.	NG	1	Door Bottom	200S
9.	NG	1	Set Gasketing	5075
10.	NG	1	Rain Drip	16 DW + 4”

F. HW-5; Each pair to have:

1.	S	2	Hinges	662HD
2.	P	2	Panic Devices	FL2208 x 4908D LBR x SNB
3.	B	2	Cylinders	
4.	S	2	Closers	
5.	T	2	Kick Plates	
6.	AB	2	Electro-Mag Holders	2100

G. HW-6: Each pair to have:

1.	S	2	Hinges	662HD
2.	T	2	Pulls	
3.	T	2	Push Plates	
4.	S	2	Closers	
5.	T	2	Kick Plates	
6.	AB	2	Electro-Mag Holders	2100
7.	NG	2	Auto Door Bottoms	422N
8.	NG	1	Set Gasketing	5075
9.	NG	2	Astragals	9115A

H. HW-7; Each pair to have:

1.	S	2	Hinges	662HD
2.	P	2	Panic Devices	2208 x 4908D LBR x SNB
3.	B	2	Cylinders	
4.	S	2	Closers	
5.	T	2	Kick Plates	
6.	T	2	Door Holders	1255 x SNB
7.	T	2	Stops	

I. HW-8; Each pair to have:

1.	S	2	Hinges	662HD
2.	P	2	Panic Devices	2208 x 4908D LBR x SNB
3.	B	2	Cylinders	
4.	S	2	Closers	
5.	T	2	Kick Plates	
6.	T	2	Stops	

J. HW-9; Each to have:

1.	S		Butts	BB1279
2.	P	1	Panic Device	2108 x 4908D x SNB
3.	B	1	Cylinder	
4.	S	1	Closer	
5.	T	1	Stop	

K. HW-10; Each to have:

1.	S		Butts	FBB179
2.	B	1	Lock	AB
3.	S	1	Closer	
4.	T	1	Kick Plate	
5.	T	1	Stop	

L. HW-11; Each to have:

1.	S		Butts	FBB179
2.	B	1	Lock	AB
3.	T	1	Stop	

M. HW-12: Each to have:

1.	S		Butts	FBB179
2.	B	1	Lock	R
3.	T	1	Stop	

N. HW-13; Each to have:

1.	S		Butts	FBB179
2.	B	1	Indicator Lock	QDB285 x 2 Emer. Keys
3.	B	1	Latch	N
4.	S	1	Closer	
5.	T	1	Kick Plate	
6.	T	1	Stop	

O. HW-14; Each to have:

1.	S		Butts	FBB179
2.	B	1	Indicator Lock	QDB285 x 2 Emer. Keys
3.	B	1	Latch	N
4.	T	1	Stop	

P. HW-15; Each to have:

1.	S		Butts	FBB179
2.	T	1	Pull	
3.	T	1	Push Plate	
4.	S	1	Closer	
5.	T	1	Kick Plate	
6.	T	1	Stop	

Q. HW-16; Each to have:

1.	S		Butts	FBB179
2.	B	1	Lock	IN
3.	T	1	Door Holder	1255 x SNB
4.	T	1	Stop	

R. HW-17; Each to have:

1.	S	1	Hinge	662HD
2.	B	1	Latch	LM9310
3.	S	1	Closer	
4.	T	1	Kick Plate	
5.	T	1	Stop & Holder	1261

S. HW-18; Each to have:

1.	S		Butts	FBB179
2.	B	1	Lock	R
3.	S	1	Closer	
4.	T	1	Kick Plate	
5.	T	1	Stop	

T. HW-19; Each to have:

1.	S		Butts	FBB179
2.	B	1	Dead Lock	48H-K
3.	T	1	Pull	
4.	T	1	Push/Pull Plate	1820
5.	S	1	Closer	(180°Swing)
6.	T	1	Armor Plate	
7.	T	1	Stop & Holder	1261

U. HW-20; Each to have:

1. All hardware by door manufacturer.

V. HW-21; Each pair to have:

1.	S		Butts	F179
2.	T	2	Roller Latches	1559 (Mount in top edge of doors)
3.	T	2	Pulls	1150 x Type N Mtg
4.	AB	2	O.H. Holders	443_ x SNB

W. HW-22; Each pair to have:

1.	S		Butts	F179
2.	B	1	Deadlock	8T3-7 S

X. HW-23; Each pair to have:

1.	S		Butts	FBB179
2.	B	1	Lock	IN
3.	S	1	Closer	
4.	T	1	Kick Plate	
5.	T	1	Stop	

END OF SECTION

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SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Glass.

B. Glazing compounds and accessories.

1.03 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealers: Sealants for other than glazing purposes.

B. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

1.04 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass; 2011.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

C. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

I. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

J. GANA (GM) - GANA Glazing Manual; 2009.

K. GANA (SM) - GANA Sealant Manual; 2008.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.06 PERFORMANCE REQUIREMENTS

A. Select type and thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with building code.
   1. Use the procedure specified in ASTM E 1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Thicknesses listed are minimum.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples 6 inch in size of glass and plastic units, showing coloration and design.

E. Certificates: Certify that products meet or exceed specified requirements.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.09 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

1.11 MAINTENANCE PRODUCTS

A. Provide two of each glass size and each glass type, of insulated glass units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

2.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
   3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
   4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Comply with 16 CFR 1201 test requirements for Category II.
   2. Plastic Interlayer:
      a. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch thick, minimum.
   3. Provide this type of glazing in the locations required by code.

C. Low E Glass: Float type, heat strengthened, clear.
   1. Coating on inner surface.
   2. Comply with ASTM C1036, Type I, transparent flat, Quality Q3 (glazing select).
   3. Comply with ASTM C1048.
   4. 6 mm minimum thick.

2.03 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Vision glazing with Low-e coating.
   1. Basis of Design: PPG Vitro Glass, Solar Ban 60, or equal.

2. Application: Exterior, except as otherwise indicated.
3. Outdoor Lite: Annealed float glass, 1/4 inch thick, minimum, Solarbronze, or equal.
4. Between-lite 1/2 inch space filled with air.
5. Indoor Lite: Annealed float glass, 1/4 inch thick, Solarban 60 Clear.
6. Total Thickness: 1 inch.
7. Durability: Certified by an independent testing agency to comply with ASTM E2190.
8. Edge Spacers: Aluminum, bent and soldered corners.
9. Edge Seal: Glass to elastomer with supplementary silicone sealant.
10. Purge interpane space with dry hermetic air.

2.04 GLAZING COMPOUNDS

A. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; grey color.

B. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.05 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; hardness range of 5 to 30 cured Shore A durometer; coiled on release paper; black color.
   1. Width: As required for application.
   2. Thickness: As required for application.

D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; Black color.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

A. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

B. Locate and secure glazing pane using glazers' clips.

C. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.07 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION

SECTION 09 05 61

COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. This section applies to all floors identified in the contract documents to receive floor coverings, including but not limited to the following:
   1. Resilient flooring.
   2. Fluid-applied flooring
   3. Carpet tile.
   4. Thin-set tile, ceramic tile and/or stone tile.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Provide alternate adhesive due to unsatisfactory moisture or pH conditions.
   1. Contractor shall perform all specified installations with alternate adhesive, if special adhesive is needed as indicated by test results.

F. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs, if remediation is needed as indicated by test results.

1.03 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

1.04 PRICE AND PAYMENT PROCEDURES

A. Section 004100 - Bid Proposal Form: Proposed unit prices and allowances.

B. Allowances: See Section 01 21 00 - Allowances and Section 004100 - Bid Proposal Form. Allowances included in the Contract (Base Bid) Amount. Allowances are based on the proposed unit price multiplied by the indicated area.
   1. Include costs for moisture and pH testing by an independent agency engaged by the Contractor in the contract sum (base bid).

C. Unit Prices: See Section 01 22 00 - Unit Prices.

D. Unit Price for Alternate Flooring Adhesive: State on the bid form the unit price per square foot for using the alternate adhesive, in the event such remediation is required.
   1. Base the unit price on the quantity indicated on the Bid Proposal Form.
   2. Indicate on the Bid Proposal Form the Allowance for Alternate Flooring Adhesive by multiplying the proposed unit price by the indicated area.
   3. Include costs for moisture and pH testing in the contract sum (base bid). Cost for moisture and pH testing is excluded from this unit price.

E. Unit Price for Remedial Floor Coating: State on the bid form the unit price per square foot for the floor coating, installed, in the event such remediation is required.
   1. Base the unit price on the quantity indicated on the Bid Proposal Form.
   2. Indicate on the Bid Proposal Form the Allowance for Remedial Floor Coating by multiplying the proposed unit price by the indicated area.

3. Include costs for moisture and pH testing in the contract sum (base bid). Cost for moisture and pH testing is excluded from this unit price.

1.05 REFERENCES

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

E. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

F. International Concrete Repair Institute (ICRI) Certification program for concrete slab moisture testing.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.07 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Include certification of accuracy by authorized official of testing agency.
   6. Submit report to Architect Engineer and Owner.
   7. Submit report not more than five business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
   1. Manufacturer's qualification statement.
   2. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
   3. Manufacturer's installation instructions.
   4. Specimen Warranty: Copy of warranty to be issued by coating manufacturer and certificate of underwriter's coverage of warranty.

1.08 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with its own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Acceptable Testing Agencies:

a. George Donnelly Testing and Inspections, #1 Curso Lane, Hot Springs Village, AR 71909, (501) 915-0626.
b. Grubbs, Hoskyn,Barton & Wyatt, Inc., 1 Trigon Pl., Little Rock, AR 72209, (501) 455-2536.
c. Other testing agent approved by Owner.
d. Other testing agent certified as an ICRI Concrete Slab Moisture Testing Technician - Grade I.

D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect Engineer when specified ambient conditions have been achieved and when testing will start.

E. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.09 WARRANTY

A. Provide a 10-year minimum Manufacturer's Material and Labor Warranty for Moisture Control System components, including replacement of all damaged floor covering.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.11 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
3. Compressive Strength: 4000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment, installed per manufacturer's instructions including mechanical surface prep.

1. Acceptable Products (As recommended by manufacturer for specific project conditions):
   a. ARDEX Engineered Cements; either ARDEX MC ULTRA, ARDEX MC RAPID or ARDEX MC PLUS epoxy moisture control system; with either ARDEX K 15 or K16 self-leveling underlayment: www.ardexamericas.com.
   b. KOSTER American Corp.; either KOSTER VAP I 2000, KOSTER VAP I 2000 F, KOSTER VAP I 2000 UFS or KOSTER VAP I 2000 ZERO VOC epoxy moisture vapor control system; with either KOSTER SL Standard or KOSTER SL Premium self-leveling underlayment: www.kosterusa.com.
   c. MAPEI; either MAPEI Planiseal EMB, MAPEI Planiseal VS ,or MAPEI Planiseal VS Fast epoxy moisture reduction barrier; with MAPEI Ultraplan 1 Plus self-leveling underlayment: www.mapei.com.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Prepare slab in accordance with ASTM F710.

B. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   8. Adhesive bond and compatibility test.
   9. Protection of substrate prior to flooring installation.

C. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.
   3. Excessive pH: If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound as recommended by flooring manufacturer.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Test in accordance with ASTM F1869 and as follows.

C. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

E. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

E. Provide finish surface tolerance meeting the requirements of the floor covering manufacturer. In the absence of manufacturer tolerance specifications ensure that the surface have no deviation exceeding 1/4" in 10' measured by the straight edge method as referenced in ACI 117 Floor Flatness Tolerances. Note: if leveling compound is required address relative humidity

content and application of remedial floor coating if required prior to the installation of leveling compound.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Metal stud wall framing.

B. Shaft wall system.

C. Metal channel ceiling framing.

D. Fire rated area separation walls.

E. Acoustic insulation.

F. Gypsum sheathing.

G. Cementitious backing board.

H. Gypsum wallboard.

I. Joint treatment and accessories.

J. Textured finish system.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 40 00 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

C. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

D. Section 07 92 00 - Joint Sealers: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.04 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2010).

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

D. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2014).

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.

F. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

I. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

J. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board; 2013.

K. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

M. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2015.

N. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.

Q. ASTM E413 - Classification for Rating Sound Insulation; 2010.

R. GA-216 - Application and Finishing of Gypsum Board; 2013.

S. GA-600 - Fire Resistance Design Manual; 2015.

T. ICC (IBC) - International Building Code; 2015.

U. UL (FRD) - Fire Resistance Directory; current edition.

1.05 SYSTEM DESCRIPTION

A. Acoustic Attenuation for Interior Partitions as Indicated as Acoustic and for Shaft Wall Partitions: calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

F. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture. Two types.

1.07 QUALITY ASSURANCE

A. Perform in accordance with ASTM C840. Comply with requirements of GA-600 for fire-rated assemblies.

1.08 MOCKUP REQUIREMENTS

A. Please prepare a 10' x 10' mock-up of special textured finish and color, for Owner approval.

B. Locate mockup in an area directed by Architect Engineer.

C. Mockup may remain as part of project, if approved.

1.09 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies as indicated on drawings.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire Rated Assemblies: Provide completed assemblies complying with applicable code.
   1. ICC IBC Item Numbers: Comply with applicable requirements of ICC (IBC) for the particular assembly.
   2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.

3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. Marino: www.marinoware.com.
   3. Phillips Manufacturing Company: www.phillipsmfg.com.
   4. The Steel Network Inc: www.SteelNetwork.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
   1. Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
   2. Studs: "C" shaped with flat or formed webs with knurled faces.
   3. Runners: U shaped, sized to match studs.
   4. Ceiling Channels: C-shaped.

C. Shaft Wall Studs and Accessories: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com.
   3. National Gypsum Company: www.nationalgypsum.com.
   4. Temple-Inland Building Product by Georgia-Pacific, LLC: www.temple.com.
   5. USG Corporation: www.usg.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, where indicated, unless otherwise indicated.
   2. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Thickness: 5/8 inch.
      a. Vertical Surfaces: 5/8 inch, or as indicated.
      b. Ceilings: 5/8 inch, or as indicated.
   4. Edges: Tapered.

C. Impact Resistant Wallboard:
   1. Application: At areas indicated on Drawings.
   2. Surface Abrasion: Level 3, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Hard Body Impact: Level 2, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   6. Paper-Faced Type: Gypsum wallboard as defined in ASTM C1396/C1396M.
   7. Glass Mat-Faced Type: Gypsum wallboard as defined in ASTM C1658/C1658M.
   8. Type: Fire resistance rated Type X, UL or WH listed.

9. Thickness: 5/8 inch.
10. Edges: Tapered.

D. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and as recommended behind epoxy coated walls..
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
a. Thickness: 1/2 and 5/8 inch, as indicated on Drawings.
b. Edges: Tapered.
c. Products:
1) GP "Denshield Tile Backer" G-P Gypsum Corporation: www.gp.com/gypsum.
2) Gold Bond "Permabase." National Gypsum: www.nationalgypsum.com.
3) USG Corporation: www.usg.com.
4) Substitutions: See Section 01 60 00 - Product Requirements.

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 5/8 inch.
3. Edges: Tapered.

F. Acoustical Wall Systems - See Section 098400 - Acoustic Wall Panels.

G. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
1. Application: Exterior sheathing, unless otherwise indicated.
2. Core Type: Type X.
3. Type X Thickness: 5/8 inch.
4. Regular Board Thickness: 5/8 inch.
5. Edges: Square.
6. Glass Mat Faced Products:
a. Georgia-Pacific Gypsum; DensGlass Sheathing.
b. Substitutions: See Section 01 60 00 - Product Requirements.

H. Shaftwall and Coreboard: Type X; sizes to minimize joints in place; 1 inch thick, double beveled edges, ends square cut.
1. Paper Faced Type: Gypsum shaftliner board or gypsum coreboard as defined ASTM C1396/C1396M; water-resistant faces.

2.04 ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch, unless otherwise indicated.

B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

C. Building Paper: Asphalt impregnated building felt conforming to ASTM D 226, Type 1.

D. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Ready-mixed vinyl-based joint compound.

4. Chemical hardening type compound.

F. Textured Finish Materials: Latex-based compound; plain.

G. Textured Finish Materials: Custom texture to be approved with mockup.

H. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.

I. Nails for Attachment to Wood Members: ASTM C514.

J. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Fasten runners to structure with short leg to finished side, using appropriate power-driven fasteners at not more than 24 inches on center.
   2. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimension and install sequentially between special friction studs.
   1. On walls over sixteen feet high, screw-attach studs to runners top and bottom.
   2. Seal perimeter of shaft wall and penetrations with acoustical sealant.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/1200.
   2. Laterally brace entire suspension system.
   3. Install bracing as required at exterior locations to resist wind uplift.

C. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.
   2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

3.04 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

F. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

G. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.

H. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.07 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.

B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.

C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.08 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructionsand to match approved sample.

B. Texture Required: Orange Peel, where indicated on Drawings.

C. Texture Required: Course Custom Texture to be approved by Owner with mockup, where indicated on Drawings; similar to the following:

3.09 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

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SECTION 09 30 00
TILING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Ceramic trim.

D. Non-ceramic trim.

1.03 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealers: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, cleaning, and preparation

C. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

D. Section 22 40 00 - Plumbing Fixtures: Shower receptor.

1.04 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2013.1.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).

I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

K. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 2010 (Revised).

L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior glue plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

N. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).

O. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).

P. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Revised).

Q. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation; 2014.

R. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2013.1.

S. ASTM C373 - Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products, Ceramic Tiles, and Glass Tiles; 2014a.

T. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Verification Samples: Full size tile for each color and pattern required, illustrating pattern and color variations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

1.07 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed

herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Ceramic Mosaic Tile, Type CT-1: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 4 x 16 inch, nominal.
   3. Shape: Rectangle.
   4. Surface Finish: glazed.
   5. Color(s): As shown on drawings.
   6. Products:
      a. Soho Style; as manufactured by Anatolia Tile and Stone; www.anatoliatile.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Quarry Tile, Type QT-1: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0.5 to 3.0 percent as tested in accordance with ASTM C373.
   2. Thickness: 1/2 inch, nominal.
   3. Surface Finish: Unglazed.
   4. Color(s): As scheduled.
   5. Trim Units: Matching bullnose, cove, cove base, and window sill or step nosing shapes in sizes coordinated with field tile.
   6. Products:
      a. Quarry Textures as manufactured by American Olean; www.americanolean.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Porcelain Tile, Type PT-1: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 24 by 24 inch, nominal.
   3. Thickness: 3/8 inch.
   4. Surface Finish: Unpolished.
   5. Trim Units: Matching cove shapes in sizes coordinated with field tile.
   6. Products:
      a. Basis of Design: American Olean, Decorum; www.americanolean.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Porcelain Tile, Type PT-2: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 2 by 2 inch, nominal.
   3. Surface Finish: Unglazed.
   4. Products:
      a. Basis of Design: American Olean; www.americanolean.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

F. Porcelain Tile, Type PT-3, 4: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 12 by 24 inch, nominal.
   3. Thickness: 3/8 inch.
   4. Surface Finish: Polished / Unpolished.
   5. Trim Units: Matching bullnose, double bullnose, cove base, and cove shapes in sizes coordinated with field tile.
   6. Products:
      a. Basis of Design: American Olean, Decorum; www.americanolean.com.

2.02 TRIM AND ACCESSORIES

A. Ceramic Trim: Matching bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
   1. Manufacturers: Same as for tile.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.

1. Applications:
   a. Open edges of floor tile: Schlüter Reno U.
   b. Wall corners, outside: Schlüter Quadec.
2. Manufacturers:
   a. Schluter-Systems: www.schluter.com.
   b. Genesis APS International: www.genesis-aps.com.
   c. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com.
   2. Custom Building Products: www.custombuildingproducts.com.
   3. LATICRETE International, Inc: www.laticrete.com.
   4. Merkrete, by Parex USA, Inc: www.merkrete.com.
   5. ProSpec, an Oldcastle brand: www.prospec.com.

B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4 or ANSI A118.15.
   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. Mapei; http://www.mapei.com/US-EN/.
      b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com.
      c. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com.

C. Organic Adhesive: Not permitted.

2.04 GROUTS

A. Manufacturers:
   1. Mapei; http://www.mapei.com/US-EN/.
   2. Custom Building Products: www.custombuildingproducts.com.
   3. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com.

B. Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
   1. Applications: Use this type of grout where indicated for wall tile joints.
   2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
   3. Color(s): As indicated, or if not indicated as selected by Architect Engineer from manufacturer's full line.
   4. Products:
      a. Mapei; http://www.mapei.com/US-EN/.
      b. Custom Building Products; Fusion Pro Single Component Grout: www.custombuildingproducts.com.
      c. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com.

C. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
   1. Applications: Joints in floor and base tile.
   2. Color(s): As indicated, or if not indicated as selected by Architect Engineer from manufacturer's full line.
   3. Products:
      a. Mapei; http://www.mapei.com/US-EN/.
      b. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout: www.custombuildingproducts.com.
      c. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com.

2.05 MAINTENANCE MATERIALS

A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
   1. Applications: Between tile and plumbing fixtures.
   2. Color(s): As selected by Architect Engineer from manufacturer's full line.
   3. Products:
      a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com.
      b. Custom Building Products; Commercial 100% Silicone Caulk: www.custombuildingproducts.com.
      c. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com.
      d. Mapei; http://www.mapei.com/US-EN/.

2.06 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
   1. Type: Fluid-applied.
   2. Thickness: 20 mils, maximum.
   3. Crack Resistance: No failure at 1/16 inch gap, minimum.
   4. Products:
      a. LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com.
      b. Mapei; http://www.mapei.com/US-EN/.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

B. Mesh Tape: 2 inch wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.
   1. Testing of concrete slabs, cleaning, and preparation in shall be in accordance with Section 09 05 61 - Common Work Results for Flooring Preparation.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

A. Install tile in accordance with TCNA Handbook (HB) for type of tile and substrate.

B. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

C. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

D. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout. Provide tile joint widths in accordance with manufacturers recommendations.

F. Form internal angles square and external angles to receive metal corner trim.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F115, with latex-Portland cement bond coat, with epoxy grout, unless otherwise indicated.
   1. Use concrete crack isolation membrane under all floor tile unless other underlayment is indicated.

3.05 INSTALLATION - WALL TILE

A. Over gypsum wallboard on wood or metal studs install in accordance with installation method appropriate for tile and substrate.

B. Over interior concrete and masonry install in accordance with installation method appropriate for tile and substrate.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 51 00
SUSPENDED ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 31 00 - Steel Decking: Placement of special anchors or inserts for suspension system.

C. Section 07 21 00 - Thermal Insulation: Acoustical insulation.

D. Section 21 13 00 - Fire Suppression Sprinklers: Sprinkler heads in ceiling system.

E. Section 23 37 00 - Air Outlets and Inlets: Air diffusion devices in ceiling.

F. Section 26 51 00 - Interior Lighting: Light fixtures in ceiling system.

G. Section 27 51 17 - Public Address Systems: Speakers in ceiling system.

H. Section 28 31 00 - Fire Detection and Alarm: Fire alarm components in ceiling system.

1.04 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, mechanical and electrical items installed in the ceiling, and seismic details to resist seismic design loads and class, including grid type, perimeter channels, hanger spacing, and cross bracing.

C. Product Data: Provide data on acoustical tile and suspension system components. All product numbers that are to be used shall be indicated.

D. Samples: Submit two samples 6 inch in size illustrating material and finish of acoustical units. Indicate what components are to be used and what spaces they are to be used.

1.07 QUALITY ASSURANCE

A. Seismic Requirements: Complete assembly shall comply with the International Building Code, as adopted by authority having jurisdiction.

1. Seismic Design Criteria: As reguired by Code and as indicated.
   a. Importance Factor: 1.25
   b. Seismic Design Category: E.
2. Contractor is responsible for obtaining approval of the authority having jurisdiction for manufacturer's alternative components and methods.
3. An independent special inspector engaged by the Owner will inspect ceiling suspension assembly, including but limited to grid, hanger placement, perimeter support, seismic joints and related details

1.08 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer(s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

2.02 ACOUSTICAL UNITS

A. Acoustical Panels Type ACT-1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:
   1. Basis of Design: Total Acoustics, School zone, Fine Fissured, Model 1713, as manufactured by Armstrong. www.armstrong.com.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inches.
   4. Composition: Wet felted.
   5. Light Reflectance: 0.85 percent, determined in accordance with ASTM E1264.
   6. NRC: 0.70, determined in accordance with ASTM E1264.
   7. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   8. Edge: Square.
   9. Surface Color: White.
   10. Surface Pattern: Non-directional fissured.
   11. Humidity Resistant.

B. Acoustical Panels Type ACT-2: Painted mineral fiber, ASTM E1264, Type IX, with the following characteristics:
   1. Basis of Design: Kitchen Zone, Model 673, as manufactured by Armstrong. www.armstrong.com.
   2. VOC Content: As specified in Section 01 61 16.
   3. Size: 24 by 24 inches.
   4. Thickness: 3/4 inches.
   5. Composition: Wet felted.
   6. Light Reflectance: 0.89 percent, determined in accordance with ASTM E1264.
   7. Ceiling Attenuation Class (CAC): 33, determined in accordance with ASTM E1264.
   8. Edge: Square.
   9. Surface Color: White.
   10. Surface Pattern: Smooth.
   11. Humidity Resistant.

C. Acoustical Panels Type ACT-3: Painted mineral fiber, ASTM E1264, Type IV, with the following characteristics:
   1. Basis of Design: Calla, Total Acoustics, Model 2820, as manufactured by Armstrong. www.armstrong.com.
   2. VOC Content: As specified in Section 01 61 16.
   3. Size: 24 by 24 inches.

4. Thickness: 7/8 inches.
5. Composition: Wet felted.
6. Light Reflectance: 0.85 percent, determined in accordance with ASTM E1264.
7. NRC: 0.70, determined in accordance with ASTM E1264.
8. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
9. Edge: Square.
10. Surface Color: White.
11. Surface Pattern: Smooth.
12. Humidity Resistant.
13. Suspension System: Exposed grid Type Prelude XL Grid.

2.03 SUSPENSION SYSTEM(S)

A. Suspension Systems - General: Complying with ASTM E580 for Seismic Design Category E; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; heavy-duty, designed for seismic category E.
   1. Profile: Tee; 15/16 inch wide face.
   2. Construction: Double web.
   3. Finish: White painted.
   4. Products:
      a. Prelude XL Heavy Duty 15/16" Exposed Tee System, as manufactured by Armstrong. www.armstrong.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

PART 3 EXECUTION

3.01 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

C. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

H. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.02 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.03 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 64 33
COMMERCIAL WOOD FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood flooring.

B. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, wood species and colors available; and installation instructions.

C. Shop Drawings: Indicate floor joint pattern and termination details.

D. Samples: Submit two samples 12 inch in size illustrating floor finish, color, and sheen.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

F. Manufacturer's Installation Instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section and be familiar with system to be installed.

1.06 FIELD CONDITIONS

A. Do not install wood flooring until wet construction work is complete and ambient air at installation space has moisture content stabilized at maximum moisture content of 40 percent.

B. Provide heat, light, and ventilation prior to installation.

C. Store materials in area of installation for minimum period of 24 hours prior to installation.

D. Maintain minimum room temperature of 65 degrees F and relative humidity in accordance with adhesive manufacturer's instructions for a minimum period of 48 hours prior to delivery of materials to installation space, during installation, and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Laminated Wood Flooring:

1. Armstrong World Industries, Inc; Performance Plus Commercial Hardwood: www.armstrong.com.
2. Substitutions: Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Acrylic Infused Engineered Hardwood Wood Flooring:
   1. Construction: Tongue and groove, self-locking, 5-ply laminated wood planks.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
   3. Surface Burning Characteristics: Flame Spread Index of 200, maximum; Smoke Developed Index of 450, maximum; when tested in accordance with ASTM E84.
   4. Color: As indicated on Finish Schedule.
   5. Thickness: 0.375 inch.
   6. Face Width: 5 inch.
   7. Edge Profile: Micro-Beveled.
   8. Treatment: Nano-Technology Coating with Lifetime Finish. Medium Gloss.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex. Type recommended by adhesive material manufacturer.

B. Adhesives: Water-resistant; types recommended by flooring manufacturer for project substrates.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances required for type of substrate and ready to receive laminated wood flooring.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of materials to substrate surface.

C. Verify that concrete sub-floor surfaces are ready for wood flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are outside the limits recommended by adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare sub-floor in accordance with flooring manufacturer's installation instructions.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is fully cured.

3.03 INSTALLATION

A. Wood Flooring:
   1. Install flooring in accordance with manufacturer's installation instructions.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damaging surfaces.

B. Clean floor surfaces in accordance with the flooring manufacturer's instructions.

3.05 PROTECTION

A. Prohibit traffic on finished floor for 24 hours after installation.

B. Place protective coverings over finished floors; do not remove coverings until after Date of Substantial Completion.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.03 RELATED REQUIREMENTS

A. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.04 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2014).

D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2008 (Reapproved 2012).

E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plan.

D. Verification Samples: Submit two samples, illustrating color and pattern for each resilient flooring product specified.

E. Concrete Testing Standard: Submit a copy of ASTM F710.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
   1. Type: As indicated on Finish Schedule.
   2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   4. Size: 12 by 12 inch.
   5. Thickness: 0.125 inch.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company: www.johnsonite.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch thick.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: As indicated on Drawings.
   7. Accessories: Premolded external corners and end stops.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Moldings, Transition and Edge Strips: As indicated on Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Test in accordance with Section 09 05 61 - Common Work Results for Flooring Preparation.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Spread only enough adhesive to permit installation of materials before initial set.

D. Fit joints and butt seams tightly.

E. Set flooring in place, press with heavy roller to attain full adhesion.

F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install tile to indicated pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.05 RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

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SECTION 09 65 65
MODULAR ATHLETIC FLOORING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. Scope
   1. The complete installation of modular sports surfacing system including the interlocking suspended high-impact polypropylene copolymer tile of proprietary formulation, supportive acoustical underlayment and striping.

B. Related work specified under other sections.
   1. Section 03 33 00 - Cast-In-Place Concrete: Concrete subfloors.
      a. The general contractor shall furnish and install the concrete subfloors.
      b. The slab shall be steel troweled to a medium-dense finish to a tolerance of ±1/8" (3.2mm) in any 10' (3m) radius. Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized. High spots shall be ground level and low spots filled with approved leveling compound.
   2. Section 11 66 23 - Gymnasium Equipment: Game standard inserts.

1.03 REFERENCES

A. ASTM (American Society for Testing & Materials)
   1. ASTM D 256
   2. ASTM D 638
   3. ASTM D 648
   4. ASTM D 785
   5. ASTM D 792
   6. ASTM C 1028
   7. ASTM G 21

B. ISO (International Organization for Standardization)
   1. ISO 1183
   2. ISO 527-1, -2
   3. ISO 179
   4. ISO 180
   5. ISO 75B-1, -2

C. EN (European Norm)
   1. EN 13036-4
   2. EN 12235:2004
   3. EN 1569:1999
   4. EN 13501-1
   5. EN 14904:2006
   6. EN ISO 2813
   7. EN ISO 5470-1

1.04 SUBMITTALS

A. Sport Court® Response™ Product Data.

B. One verification sample of each color specified.

C. Sport Court Modular Sports Flooring Installation Guide.

D. Sport Court Modular Sports Flooring Care and Maintenance Guide.

E. Sport Court Response Warranty.

1.05 QUALITY ASSURANCE

A. MATERIAL SUPPLIER:
   1. Shall be Connor Sport Court International, Inc. (manufacturer)
   2. Manufacturer must be ISO 9001:2008 and ISO 14001:2004 Certified to assure proper quality and environmental control.
   3. Manufacturer shall be a Zero Waste company.
   4. Manufacturer shall have produced sports surfaces for a longer period of time than their stated warranty.
   5. Surfaces must be certified for competition by the international federations for basketball (FIBA), volleyball (FIVB), handball (IHF) and badminton (BWF).

B. INSTALLER:
   1. The complete installation of the flooring system as described in these specifications shall be carried out by an experienced installer (Flooring Contractor), and the work shall be performed in accordance with current Sport Court installation instructions.
   2. Installer (Flooring Contractor) shall be liable for all matters related to installation for a period of one year after the floor has been substantially installed and completed.
   3. Successful bidder must submit a minimum of five (5) completed modular projects of similar magnitude and complexity within the last two (2) years.
   4. Bidder must provide all sample tile, accessory products, and documentation.

1.06 DELIVERY, STORAGE AND HANDLING

A. Materials must be delivered in manufacturer's original, unopened and undamaged packaging with identification labels intact.

B. Store material on a clean, dry, and flat surface, protected from exposure to harmful weather conditions or possible damage.

C. Storage conditions shall be 55°F to 80°F (13°C to 27°C).

1.07 SITE CONDITIONS

A. In order to prevent damage and not void the warranty, installation of modular materials shall not commence until all other finishes and overhead mechanical trades have completed their work in the modular floor areas.

B. Permanent heat, light and ventilation shall be installed and operating during and after installation.

C. Subfloors shall be clean, dry and free from dirt, dust, oil, grease, paint, old adhesive residue, or other foreign materials.

D. Flooring installation shall not begin until the levelness requirements of concrete subfloors have been met.

E. The installation area shall be closed to all traffic and activity for a period to be set by the flooring contractor.

F. Product shall be conditioned at temperatures between 55° F to 80° F (13° C to 27°C) and shall be maintained for 72 hours prior to, during, and 72 hours after installation.

G. Environmental Limitations
   1. Comply with the Sport Court requirements.
   2. Adhere to all MSDS requirements for materials employed in the work.
   3. Protect all persons from exposure to hazardous materials at all times.

H. After modular floors are installed and the game lines painted, the area is to be closed to allow curing time for the system, typically 3-5 days. No other trades or personnel are allowed on the floor until it has been accepted by the owner.

1.08 WARRANTY

A. Sport Court provides a limited warranty of fifteen (15) years on the materials it has supplied. (A copy of the full warranty, with its Terms and Exclusions, is available from the authorized Sport

Court Dealer.) This 15-Year Limited Warranty is subject to the Indoor Modular Flooring Warranty and all of its provisions. This warranty is expressly limited to the flooring materials (goods) supplied by Sport Court. During the period covered under this Indoor Modular Flooring Warranty, Sport Court shall repair/replace any defective tiles with the same or substantially similar product according to the schedule in the Indoor Modular Flooring Warranty. The Indoor Modular Flooring Warranty does not cover floor damage caused (wholly or in part) by fire, winds, floods, moisture, other unfavorable atmospheric conditions or chemical action, nor does it apply to damage caused by ordinary wear, misuse, abuse, negligent or intentional misconduct, aging, faulty building construction, concrete slab separation, faulty or unsuitable subsurface or site preparation, settlement of the building walls or faulty or unprofessional installation of Sport Court flooring systems.

B. Sport Court shall not be liable for incidental or consequential losses, damages or expenses directly or indirectly arising from the sale, handling or use of the materials (goods) or from any other cause relating thereto, and their liability hereunder in any case is expressly limited to the replacement of materials (goods) not complying with this agreement or, at their election, to the repayment of, or crediting buyer with, an amount equal to the purchase price of such materials (goods), whether such claims are for breach of warranty or negligence. Any claim shall be deemed waived by buyer unless submitted to Sport Court in writing within 30 days from the date buyer discovered, or should have discovered, any claimed breach.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sport Court Response™ Patented Suspended Flooring shall be:
   1. Solid-top design.
   2. Metric-sized: 25cm x 25cm x 12.7mm (9.842” x 9.842” x ½”).
   3. High-impact polypropylene copolymer suspended modules.
   4. 281 individual hexagonal cell support structure.
   5. The tile shall have a patented positive locking system.
   6. Provide ADA compliant termination and transition as required for edge condition. Corrdinate with other trades.

B. Standard Colors as indicated on Finish Schedule.

C. Weight: 0.60 ± 0.01 lbs. (271 ± 5 grams)

D. Packaging: Product is shipped in pre-assembled sheets (2x4 modules per sheet, 6 sheets per box).

E. Material Test Results
   1. Rockwell hardness: (ASTM D 785) 65 R
   2. Heat deflection: (ASTM D 648 @ 66 psi) 85°C (ISO 75B-1, -2 @ 40.45 MPa): 73°C Unannealed
   3. Tensile Yield Strength: (ASTM D 638) 3,000psi (ISO 527-1, -2) 20 MPa
   4. Elongation at Yield: (ASTM D 638) 5% (ISO 527-1, -2) 5%
   5. Notched Izod: (ASTM D 256) No break at 23°C (ISO 180) 31kJ/m2
   6. Charpy Notched Impact: (ISO 179 @ 23°C) 26kJ/m2
   7. Density: (ASTM D 792) 0.902 specific gravity 23/23°C (ISO 1183 @ 23°C) 0.90 g/cm3

F. Product Test Results
   1. Friction: (ASTM C1028) Dry: 0.60 (EN 13036-4) Dry: 105
   2. Rolling Load: (EN 1569:1999) 0.43mm No damage
   3. Reaction to Fire: (EN 13501-1) Efl
   4. Emission of Formaldehydes (EN 14904:2006) E1
   5. Content of Pentachlorophenol (EN 14904:2006) Not Containing
   6. Specular Gloss (EN ISO 2813) 27%
   7. Flatness: 0.0” +0.029” / -0.0” (0.0mm +0.74mm / -0.0mm)
   8. Lateral Forgiveness™: +0.045” / -0.0” (+1.14mm / -0.0mm)

G. Load Bearing Capacity: 200 psi (1.38 MPa)

H. Underlayment
   1. Multi-purpose recycled rubber underlayment
   2. Thickness: 0.06” (1.5mm)
   3. Density: 60 lbs. cu. ft. (961 kg/m3)
   4. Durometer: 60 ± 5 on the Shore M or Shore A scales.

I. Sanitary Information
   1. Resistance to fungi (when tested in compliance with ASTM G-21 and MIL standard 810-D procedure 508.3). All basic organisms tested (ATCC #6205-11797) and were found to have zero growth.
   2. Resistance to the following:
      a. Bacteria and mildew resistance
      b. Gram-positive bacterial Staphylococcus Aureus
      c. Gram-negative Klebsiella Pneumoniae
      d. Pink-staining organism
      e. STV Reticulum
      f. Surface fungi growth prior to and following leaching

J. Game Line Paint
   1. Sport Court adhesion promoter – proprietary adhesion promoter as supplied by Sport Court.
   2. Paint – aliphatic polyurethane as supplied by Sport Court. Select from standard colors.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect concrete slab for contamination, dryness and levelness. Report any discrepancies to the general contractor.

B. Concrete slab shall be broom cleaned, mopped and dust free by the general contractor.

C. Installer (Flooring Contractor) shall document all working conditions as specified in PART 1 – GENERAL prior to starting installation. Report any discrepancies to the general contractor.

3.02 INSTALLATION

A. Underlayment – Rubber underlayment shall be unrolled and allowed to relax. All butt joints shall be properly trimmed, fitted, and seamed together with an approved all-purpose tape.

B. Floor shall be installed to pre-approved layout.

C. Minimum clearance at all vertical obstructions of 3/4 inch (19mm) is required.

D. Floor surface shall be clean and dust free.

E. Game Lines
   1. Use only high quality masking tape approved by Sport Court.
   2. Lines shall be primed and painted using Sport Court proprietary adhesion promoter and recommended aliphatic polyurethane paint.
   3. Provide game lines as indicated on drawings.
   4. Room temperature shall be >55° F (13°C) and rising during paint installation.

F. Wall Base: Install cove base anchored to walls with base cement.

G. Remove all excess and waste materials from the area of work. Dispose of empty containers in accordance with federal and local statutes.

END OF SECTION

SECTION 09 68 13
TILE CARPETING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.04 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

B. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two full size carpet tiles illustrating colorand pattern design for each carpet color selected.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.07 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

2.02 MATERIALS

A. Carpet Tile: As indicated on Color and Finish Schedule, manufactured in one pattern/color dye lot.

B. CPT-2 - Basis of Design Product for Walk-off Carpet Tile: Step-in Style II by Mohawk Group.
   1. Carpet bonded to 1/8 to 1/4 inch thick, flexible vinyl backing to form mats 3/8 or 7/16 inch thick with nonraveling edges.

2. Tile Sizes: 124 x 24 inch.
3. Construction Type: Tufted Textured Loop and cut.
4. Gauge: 5/32.
5. Dye Method: 100% Solution dyed nylon.
6. Color and Pattern: As indicated on Finish Schedule.
7. Installation: Quarter-turn.
8. Tufted Yard Weight: 30 oz.
9. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648, Class I.
10. Smoke Density: ASTM E662 < 450.
11. VOC Content: Comply with Section 01 61 16.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Vinyl, color and style as shown on Finish Schedule.

C. Adhesives:
1. As recommended by carpet manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
1. Test in accordance with Section 09 05 61.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. All carpet, with the exception of the ramped flooring in the auditorium, to be installed with tactiles. Ramps to receive full adhesive as recommended by manufacturer.

D. Blend carpet from different cartons to ensure minimal variation in color match.

E. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

F. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

G. Fully adhere carpet tile to substrate, in areas indicated on drawings to be adhered.

H. Trim carpet tile neatly at walls and around interruptions.

I. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 90 00
PAINTING AND COATING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, varnishes, and other coatings.

C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.

D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically so indicated.
   9. Ceramic and other tiles.
   10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Exterior insulation and finish system (EIFS).
   12. Glass.
   13. Concrete masonry in utility, mechanical, and electrical spaces.
   14. Acoustical materials, unless specifically so indicated.
   15. Concealed pipes, ducts, and conduits.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

C. ASTM D 523 - Standard Test Method for Specular Gloss.

D. GreenSeal GS-11 - Paints and Coatings; 2013.

E. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com

F. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; Current Edition.

G. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

1.04 GLOSS / SHEEN STANDARDS AND DEFINITIONS

A. Gloss Level 1: Matte or Flat Finish - Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: Eggshell Finish - 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: Satin Finish - 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: Semi-Gloss Finish - 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: Gloss Finish - 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect Engineer before preparing samples, to eliminate sheens definitely not required.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect Engineer.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as siding, have been approved.

D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data on color, cleaning, touch-up, and repair of painted and coated surfaces.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Paint and Coatings: 1 gallon of each color; store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

C. Material Safety Data Sheets: At project site maintain file of MSDS sheets for each product used; become familiar with and follow manufacturer's stated application and safety requirements.

1.07 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 100 feet long by 100 feet wide, illustrating paint coating color, texture, and finish.

C. Provide door and frame assembly illustrating paint coating color, texture, and finish.

D. Locate where directed.

E. Approved mock-up may remain as part of the work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.

B. Paints (Standard Paints): Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co: www.benjaminmoore.com.
   2. PPG Paints: www.ppgpaints.com.
   3. Sherwin-Williams Company: www.sherwin-williams.com.
   4. Farrell-Calhoun: www.farrellcalhoun.com.

C. Manufacturers (Specialty High-Abuse Paints): Subject to compliance with requirements, provide products by one of the following:
   1. Thorocoat as manufactured by BASF Building Systems; www.basf-coatings.com.
   2. Scuffmaster Scrubtough as manufactured by Master Coating Technologies; http://www.scuffmaster.com.
   3. Sherwin Williams; www.sherwin-williams.com.
   4. PPG; www.ppg.com.
   5. Substitutions: See Section 016000 - Product Requirements.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. MPI Standards: Provide products that comply with the MPI standards indicated but that are not necessarily listed in its "MPI Approved Products List."
   2. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   4. Supply each coating material in quantity required to complete entire project's work from a single production run.

5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
b. Architectural coatings VOC limits of the State of Arkansas.
2. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
3. Patching Material: Latex filler.
4. Fastener Head Cover Material: Latex filler.

2.03 PAINT SYSTEMS - GENERAL

A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.

B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.

C. Provide colors as scheduled on Drawings, Color and Finish Schedules, or as selected by Architect Engineer.

2.04 PAINT SYSTEMS - EXTERIOR

A. General: Exterior Concrete, Masonry and Overhead Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry, and cement board.
1. Preparation as specified by manufacturer.
2. Two top coats and one coat primer recommended by manufacturer.

B. Concrete Vertical and Overhead Surfaces:
1. High Build Latex: High Build Latex MPI #40, low gloss.
2. Approved products:
a. PPG
1) Primer: Primer as recommended by manufacturer.
2) Two Coats: PPG 4-22 Series Perma Crete High Build 100% Acrylic Topcoat.
b. Sherwin Williams
1) Primer: Loxon Masonry Primer A24W8300
2) Two Coats: Conflex Hi Build Elastomeric Coating A5W451
c. Benjamin Moore
1) Primer: As recommended by manufacturer.
2) Two Coats: Coronado 162-1 Elastite 100% Acrylic Elastomeric Waterproofing
d. Farrell-Calhoun (Green):
1) Primer: Farrell-Calhoun #235 Interior/Exterior 100% Acrylic Latex Undercoater;
2) Two Coats: Farrell-Calhoun #2300 100% Acrylic Elastomeric Coating

C. Concrete Paving Marking:
1. Latex Zone / Traffic Marking: MPI #97.
2. Approved products:
a. PPG
1) Primer as recommended by manufacturer.
2) Two Coats PPG 11-53 Zoneline Traffic & Zone Marking Paint.
b. Sherwin Williams
1) 1st Coat: SW Set Fast Acrylic Line Marking Paint (White, Yellow, Blue, Black, Red)
2) 2nd Coat: SW Set Fast Acrylic Line Marking Paint (White, Yellow, Blue, Black, Red)
c. Benjamin Moore (Select one of the following):
1) Two Coats: Benjamin Moore (BM) P58 Safety & Zone Marking Acrylic

2) Two Coats: Coronado Super Kote 5000 Acrylic Traffic Marking Paint 66 line
3) Two Coats: Coronado Super Kote 5000 Quick Dry Acrylic Traffic Paint 1406
4) Two Coats: Insl-X TP-2200 Latex Traffic Paint

d. Farrell-Calhoun (Green):
1) Two Coats Finish: Farrell-Calhoun #1040 (White) /1041 (Yellow) Tuff-Boy Water Based Zone Marking Paint.

D. Masonry/Concrete, Opaque, Latex:
1. High Build Latex: Two coats MPI #40, low gloss.
2. Approved Products:
a. PPG
1) Block Filler as recommended by manufacturer.
2) Two coats PPG 4-22 Series Perma Crete High Build 100% Acrylic Topcoat.
b. Sherwin Williams:
1) Block Filler: Preprite Block Filler B25W25.
2) Two Coats: A-100 Acrylic Latex Flat/Satin/Gloss A6/A82/A8 Series .
c. Benjamin Moore
1) Block Filler as recommended by manufacturer.
2) Two Coats: Coronado 162-1 Elastite 100% Acrylic Elastomeric Waterproofing.
d. Farrell-Calhoun (Green):
1) Block Filler: Farrell-Calhoun #470A Interior/Exterior Acrylic Latex Masonry Block Filler.
2) Two Coats: Farrell-Calhoun #2300 100% Acrylic Elastomeric Coating.

E. Ferrous Metals, Primed, Latex:
1. Quick Dry Enamel: Q.D. Primer MPI #76, Q.D. Enamel MPI #81 or 96, Semi-gloss.
2. Approved Products:
a. PPG:
1) Primer: MPI #76 PPG 94-258 Multiprime Fast Dry 2.8 VOC Universal Primer.
2) Two Coats: MPI #81 - PPG 7-844 Series Int. Industrial Semi-Gloss Oil.
b. PPG (Green):
1) Primer: MPI #107 Approved Primer: 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer.
2) Two coats: MPI #153 Approved Finish: 90-1210 Series Pitt Tech Plus Int/Ext SG DTM Ind. Enamel.
c. Farrell-Calhoun
1) Primer: Farrell-Calhoun #1024/1069 Tuff-Boy Quick Dry Rust-Stop Primers.
2) Two Coats: Farrell-Calhoun #800 Line Tuff-Boy Interior/Exterior Industrial Gloss Enamel.
d. Sherwin Williams
1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310.
2) Two Coats: DTM Acrylic Semi Gloss Coating B66W211.
e. Benjamin Moore
1) Primer: Corotech V131 Universal Metal Primer.
2) Two Coats: BM P24 D.T.M. Alkyd Semi-gloss (or) 96 Corotech V230. Alkyd Quik Dry Enamel or V220 Rapid Dry Enamel.

F. Galvanized Metals, Not Chromate Passivated:
1. Latex: Cementitious Primer MPI #26, Latex MPI #11, semi-gloss.
2. Approved Products:
a. PPG (Green):
1) Primer: 90-912 Pitt Tech Plus Int/Ext DTM Acrylic Primer; MPI #11 Approved.
2) Two coats: 6-610XI Series Speedhide 100% Acrylic Exterior. Semi-Gloss Finish.
b. Sherwin Williams
1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310.
2) Two Coats: DTM Acrylic Semi Gloss Coating B66W211 Finish.

c. Benjamin Moore
   1) Primer as recommended by manufacturer.
   2) Two Coats: Benjamin Moore N449 Ultra Spec EXT Finish.
d. Farrell-Calhoun (Green):
   1) Primer: Farrell-Calhoun #5-56 100% Acrylic All Purpose Metal Primer.
   2) Two Coats: Farrell-Calhoun #2400 Line 100% Acrylic Exterior Gloss Enamel Finish.

G. Aluminum , Unprimed, Alkyd, 3 Coat: One coat etching primer; two coats enamel finish.
1. Latex: Q.D. Primer MPI #95, Latex MPI #11, semi-gloss.
2. Approved Products:
   a. PPG:
      1) Primer: MPI #95 Approved 6-204 Speedhide Int/Ext Zinc Chromate Metal Primer.
      2) Two coats: MPI #11 Approved 6-610XI Series Speedhide 100% Acrylic Exterior Semi-Gloss Finish.
   b. PPG (Green):
      1) Primer: MPI #107 Approved 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer.
      2) Two coats: MPI #11 Approved 6-610XI Series Speedhide 100%. Acrylic Exterior Semi-Gloss Finish.
   c. Benjamin Moore
      1) Primer: Benjamin Moore P04 Super Spec HP Acrylic Metal Primer.
      2) Two Coats: Benjamin Moore N449 Ultra Spec EXT Finish.
   d. Sherwin Williams
      1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310.
      2) Two Coats: DTM Acrylic Semi Gloss Coating B66W211 Finish.
   e. Farrell-Calhoun
      1) Primer: Farrell-Calhoun Primer #5-56 100% Acrylic All Purpose Metal Primer.
      2) Two Coats: Farrell-Calhoun #2400 Line 100% Acrylic Exterior Gloss Enamel Finish.

2.05 PAINT SYSTEMS - INTERIOR

A. General: All Interior Surfaces Indicated to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry, wood, plaster, uncoated steel, shop primed steel, galvanized steel, and aluminum.
1. Two top coats and one coat primer.
2. Primer(s): As recommended by manufacturer of top coats.

B. Concrete Masonry Units:
1. One coat block filler. Two coats Waterbased Epoxy.
2. Approved Products:
   a. PPG:
      1) Block Filler: PPG 6-15 Speedhide Latex Block Filler (MPI #4)
      2) Two Coats: PPG 98-1 Series Aquapon WB Polyamide Epoxy
   b. Sherwin Williams Interior CMU Walls Epoxy Finish (Low Voc System Catalyzed) (Green)
      1) Block Filler: Preprite Block Filler B25W25
      2) Two Coats: Water Based Catalyzed Epoxy Semi Gloss/Gloss B70W211/B60V25/15
   c. Sherwin Williams Interior CMU Walls Epoxy Finish (Low Voc System Pre-Catalyzed) (Green)
      1) Block Filler: Preprite Block Filler B25W25
      2) Two Coats: Pro Industrial Pre Catalyzed Epoxy Egshel/Semi Gloss K45/46W151
   d. Sherwin Williams Interior CMU Walls (Flat , Egshel, Semi Gloss)
      1) Block Filler: Preprite Block Filler B25W25

2) Two Coats: Promar 200 Latex Flat/Egshel/Semi Gloss B30/20/31W2251
e. Sherwin Williams (Green): Interior CMU Walls (Flat , Egshel, Semi Gloss)
1) Block Filler: Preprite Block Filler B25W25
2) Two Coats: Promar 200 0 Voc Latex Flat/Egshel/Semi Gloss B30/20/31W2651
f. Sherwin Williams (Green): Interior CMU Walls Epoxy Finish (Low Voc System Catalyzed)
1) Block Filler: Preprite Block Filler B25W25
2) Two Coats: Water Based Catalyzed Epoxy Semi Gloss/Gloss B70W211/B60V25/15
g. Sherwin Williams (Green): Interior CMU Walls Epoxy Finish (Low Voc System Pre Catalyzed)
1) Block Filler: Preprite Block Filler B25W25
2) Two Coats: Pro Industrial Pre Catalyzed Epoxy Egshel/Semi Gloss K45/46W151
h. Benjamin Moore
1) Block Filler: Benjamin Moore 206 Super Spec High Build Block Filler.
2) Two Coats: Corotech V440 Waterbased Amine Epoxy.
i. Farrell-Calhoun (Green):
1) Block Filler: Farrell-Calhoun #470A Interior/Exterior Acrylic Latex Masonry Block Filler;
2) Two Coats: Farrell-Calhoun #1200WB 100% Acrylic Waterborne Epoxy.

C. Structural Steel and Metal Fabrications:
1. Quick Dry Enamel: Q.D. Primer MPI #95, Q.D. Enamel MPI #81, semi-gloss.
2. Approved Products:
a. PPG:
1) Primer: MPI #95 Approved Primer: 6-204 Speedhide Int/Ext Zinc Chromate Metal Primer;
2) Two coats: MPI #81 Approved Finish: 7-844 Series Int. Industrial Semi-Gloss Oil
b. PPG (Green):
1) Primer: MPI #107 Approved Primer: 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer;
2) Two coats: MPI #153 Approved Finish: 90-1210 Series Pitt Tech Plus Int/Ext SG DTM Ind. Enamel.
c. Sherwin Williams
1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310
2) Two Coats: Promar 200 Alkyd Semi Gloss B34W251
d. Sherwin Williams (Interior Exposed Structural Steel Ceilings, Ceiling Decks, Ductwork)
1) Primer: As recommended by manufacturer.
2) Two Coats: Water Based Acrylic Dryfall Flat White/ Eggshell White, Flat Black B42W1/2/BW3
e. Sherwin Williams (Green):
1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310
2) Two Coats: Pro Industrial 0 Voc Acrylic Semi Gloss Coating B66W651
f. Benjamin Moore
1) Primer: Benjamin Moore P04 Super Spec HP Acrylic Metal Primer.
2) Two Coats: Benjamin Moore P24 D.T.M. Alkyd Semi-gloss
g. Farrell-Calhoun
1) Primer: #1024/1069 Tuff-Boy Quick Dry Rust-Stop Primers;
2) Two Coats: Farrell-Calhoun #800 Line Tuff-Boy Interior/Exterior Industrial Gloss Enamel
h. Farrell-Calhoun (Green):
1) Primer: #5-56 100% Acrylic All Purpose Metal Primer;
2) Two Coats: Farrell-Calhoun #8000 Line Tuff-Boy Waterborne 100% Acrylic DTM Enamel.

D. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals, wood, and _____:
   1. Two top coats and one coat primer.
   2. Latex: W.B. Primer MPI #134, Latex MPI #54, gloss level 5.
   3. Approved Products:
      a. PPG:
         1) Primer: MPI #134 Approved Primer 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer;
         2) Two Coats: MPI #54 Gloss Level 5 Approved Finish: 6-4510 Series Speedhide Zero Int. Latex SG
      b. Sherwin Williams (Green):
         1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310
         2) Two Coats: Pro Industrial 0 Voc Acrylic Semi Gloss Coating B66W651
      c. Benjamin Moore
         1) Primer: Benjamin Moore P04 Super Spec HP Acrylic Metal Primer or BM P25 Super Spec D.T.M. Acrylic Low Lustre.
         2) Two Coats: Benjamin Moore N540 Ultra Spec 500 gloss.
      d. Farrell-Calhoun (Green):
         1) Primer: Farrell-Calhoun #5-56 100% Acrylic All Purpose Metal Primer
         2) Two Coats: Farrell-Calhoun #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel

E. Aluminum: Including aluminum.
   1. Applications include but are not limited to frames, sash, sills, flashing, handrails, railings, and posts.
   2. Latex: Q.D. Primer MPI #95, Latex MPI #52, gloss level 3.
   3. Approved Products:
      a. PPG:
         1) Primer: MPI #95 Approved Primer: 6-204 Speedhide Int/Ext Zinc Chromate Metal Primer.
         2) Two Coats: MPI #52 Gloss Level 3 Approved Finish: 6-3511 Series Speedhide Int. Satin Acrylic Latex.
      b. PPG (Green):
         1) Primer: MPI #134 Approved Primer: 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer.
         2) Two Coats: MPI #52 Gloss Level 3 Approved Finish: 6-3511 Series. Speedhide Int. Satin Acrylic Latex.
      c. Sherwin Williams (Green)
         1) Primer: Pro Industrial Pro Cryl Universal Metal Primer B66W310.
         2) Two Coats: Pro Industrial 0 Voc Acrylic Semi Gloss Coating B66W651.
      d. Benjamin Moore
         1) Primer: Benjamin Moore BM P04 Super Spec HP Acrylic Metal Primer.
         2) Two Coats: Benjamin Moore BM N538 Ultra Spec 500 eggshell.
      e. Farrell-Calhoun (Green):
         1) Primer: Farrell-Calhoun #5-56 100% Acrylic All Purpose Metal Primer.
         2) Two Coats: Farrell-Calhoun #8000 Line Tuff-Boy Waterborne 100% Acrylic DTM Enamel.

F. Paint I-TR -W - Transparent Finish on Wood, Unless Otherwise Indicated:
   1. Stain: Semi-Transparent Stain for Wood; MPI #90.
   2. Top Coat(s): Polyurethane Varnish, Oil Modified; MPI #56, 57.
   3. Basis of Design Products; or approved equal:
      a. Sherwin Williams (Green) Interior Wood Stained
         1) 1st Coat: Sherwood Water Reducible Wiping Stain S64 Series.
         2) 2nd Coat: Kem Aqua Water Reducible Sealer T65F520..
         3) 3rd Coat: Kem Aqua Water Reducible Finish T75F528.

b. Farrell-Calhoun - Waterborne System:
1) Stain: Farrell-Calhoun Wood Kraft Waterborne Penetrating Wiping Stains 1500
2) Interior Varnish: Farrell-Calhoun Wood Kraft Interior Waterborne Acrylic-Polyurethane Varnish 1190 Line
3) Int/Ext Varnish: Farrell-Calhoun Wood Kraft Interior/Exterior Spar Varnish Waterborne Acrylic-Polyurethane Varnish 1160 Line

G. Wood, Opaque, Alkyd:
1. Latex: Oil/Alkyd Primer MPI #45, Latex MPI #54, gloss level 5
2. Approved Products:
a. PPG:
1) Primer: MPI #45 Approved Primer 17-956 Seal Grip Int. Alkyd Enamel Undercoater.
2) Two Coats: MPI #54 Gloss Level 5 Approved Finish: 6-4510 Series Speedhide Zero Int. Latex SG.
b. Sherwin Williams Interior Wood Painted
1) Primer: Premium Wall and Wood Primer B28W8111.
2) Two Coats: Promar 200 Alkyd Semi Gloss B34W251.
c. Benjamin Moore
1) Primer: Benjamin Moore BM C245 Super Spec Alkyd Undercoater & Primer Sealer.
2) Two Coats: Benjamin Moore N540 Ultra Spec 500 gloss.

H. Wood, Opaque, Latex:
1. Latex: Latex Primer MPI #50, Latex MPI #54, gloss level 5
2. PPG (Green):
a. Primer: MPI #50 Approved Primer 6-4900 Speedhide Zero Int. Latex Sealer.
b. Two Coats: MPI #54 Gloss Level 5 Approved Finish: 6-4510 Series. Speedhide Zero Int. Latex SG.
3. Sherwin Williams (Green) Interior Wood Painted
a. Primer: Premium Wall and Wood Primer B28W8111.
b. Two Coats: Pro Classic Waterborne Acrylic Semi Gloss B31W1151.
4. Farrell-Calhoun
a. Primer: Farrell-Calhoun #599 Enamel Undercoater.
b. Two Coats: Farrell-Calhoun #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel.
5. Farrell-Calhoun (Green)
a. Primer: Farrell-Calhoun #699 Waterborne 100% Acrylic Enamel Undercoater.
b. Two Coats: Farrell-Calhoun #600 Line 100% Acrylic Interior Semi-Gloss Latex Enamel.

I. Wood, Opaque, Epoxy - Chemical Resistant
1. PPG
a. 1st Coat: PPG Paints 17-921 Seal Grip Int/Ext 100% Acrylic Universal Primer
b. Two Coats: PPG PMC Amerlock 2 Polyamide Epoxy
2. Sherwin Williams
a. Primer: B28W8111 Premium Wall and Wood Primer.
b. Two Coats: B70W211/B60V15/25
3. Farrell-Calhoun
a. Primer: 4426 or 4428 reduced 1/2 pint per galolon with water.
b. Two Coats: Devoe Tru-Glaze-WB 4426 Semi-Gloss or 4428 Gloss Epoxy.

J. Gypsum Board, Latex-Acrylic:
1. Latex: Latex Primer Sealer MPI #50, Latex #52, gloss level 3.
2. Approved Products:
a. PPG:
1) Primer: MPI #50 Approved Primer 6-4900 Speedhide Zero Int. Latex SealeR;

2) Two coats: MPI #52 Gloss Level 3 Approved Finish: 6-3511 Series. Speedhide Int. Satin Acrylic Latex.

b. Sherwin Williams .
1) Primer: Preprite Hi Build Primer B28W8601
2) Two Coats: Promar 200 Latex Flat/Egshel/Semi Gloss B30/20/31W2251.

c. Sherwin Williams (Green).
1) Primer: Promar 200 0 Voc Latex Primer B28W2600.
2) Two Coats: Promar 200 0 Voc Latex Flat/Egshel/Semi Gloss B30/20/31W2651.

d. Benjamin Moore
1) Primer: Benjamin Moore N534 Ultra Spec 500 Latex Primer.
2) Two Coats: Benjamin Moore N538 Ultra Spec 500.

e. Farrell-Calhoun (Green)
1) Primer: Farrell-Calhoun #380 Perfik-Seal Interior Latex Primer/Sealer.
2) Two Coats: Farrell-Calhoun #670 Line Interior Latex Satin Enamel.

K. Gypsum Board - Epoxy
1. Epoxy, W.B.: Latex Primer Seal MPI #50, Epoxy MPI #115, 215; Gloss.
2. Approved Products:
a. Sherwin Williams Interior Gypsum Board Walls Epoxy Finish (Catalyzed)
1) Primer: Preprite Hi Build Primer B28W8601
2) Two Coats: Water Based Catalyzed Epoxy Semi Gloss/Gloss B70W211/B60V25/15

b. Sherwin Williams Interior Gypsum Board Walls Epoxy Finish (Pre Catalyzed)
1) Primer: Preprite Hi Build Primer B28W8601
2) Two Coats: Pro Industrial Pre Catalyzed Epoxy Egshel/Semi Gloss K45/46W151

c. Sherwin Williams (Green). Interior Gypsum Board Walls Epoxy Finish (0 Voc /Crossover for Scuffmaster Scrub Tough)
1) Primer: Promar 200 0 Voc Latex Primer B28W2600
2) Two Coats: Pro Industrial 0 Voc Catalyzed Epoxy B73 Series

d. Sherwin Williams (Green).. Interior Gypsum Board Walls Epoxy Finish (Low Voc System Catalyzed)
1) Primer: Promar 200 0 Voc Latex Primer B28W2600
2) Two Coats: Water Based Catalyzed Epoxy Semi Gloss/Gloss B70W211/B60V25/15

e. Sherwin Williams (Green).. Interior Gypsum Board Walls Epoxy Finish (Low Voc System Pre Catalyzed)
1) Primer: Promar 200 0 Voc Latex Primer B28W2600
2) Two Coats: Pro Industrial Pre Catalyzed Epoxy Egshel/Semi Gloss K45/46W151

f. PPG:
1) Primer: MPI #50 Approved Primer: 6-4900 Speedhide Zero Int. Latex Sealer;
2) Two coats: MPI #115/215- Not MPI Approved: 16-510 Series Pitt Glaze WB1 Int. One Pack Acrylic Epoxy

g. Benjamin Moore
1) Primer: Benjamin Moore N534 Ultra Spec 500 Latex Primer.
2) Two Coats: Coronado 1138 Industrial Acrylic Epoxy.

h. Farrell-Calhoun (Green)
1) Primer: Farrell-Calhoun #380 Perfik-Seal Interior Latex Primer/Sealer;
2) Two Coats: Farrell-Calhoun #1200WB 100% Acrylic Waterborne Epoxy

L. Painted Plywood Backing Panels for Data/Telephone/Communications Equipment (Class A Flamespread Classification On Fir) -Fire-Retardant Coating, Intumescent:
1. One coat of fire-retardant primer sealer.
2. Gloss: Two coats of intumescent coating, flame/smoke rating of 25/50; Painted Plywood Backing Panels for Data/Telephone/Communications Equipment (Class A Flamespread Classification On Fir) manufactured by Flamort www.flamort.com.

M. Bituminous Coated Surfaces:
   1. INT 10.2A Latex: Rust Inhibitive Primer MPI #107, Latex #52, gloss level 3.
   2. Approved Products:
      a. PPG:
         1) MPI #107 Approved Primer: 90-912 Series Pitt Tech Plus Int/Ext DTM Acrylic Primer.
         2) Two Coats: MPI #52 Gloss Level 3 Approved Finish: 6-3511 Series Speedhide Int. Satin Acrylic Latex.
      b. Benjamin Moore
         1) Primer: Benjamin Moore P04 Super Spec HP Acrylic Metal Primer or BM P25 Super Spec D.T.M. Acrylic Low Lustre.
         2) Two Coats: N538 Ultra Spec 500.
      c. Farrell-Calhoun (Green)
         1) Primer: Farrell-Calhoun #5-56 100% Acrylic All Purpose Metal Primer.
         2) Two Coats: Farrell-Calhoun #670 Line Interior Latex Satin Enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect Engineer of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   3. Concrete Floors and Traffic Surfaces: 8 percent.
      a. Measure the ph factor of concrete, masonry, and mortar before starting any finishing process, using the method specified in MPI Architectural Painting Manual.
         1) Report results in writing to Architect Engineer before starting work.
         2) If results of test indicates need for remedial action, provide written description of remedial action. If a different primer or paint systems is required, state the total cost of the change. Do not proceed with remedial action or change without receiving written authorization from Architect Engineer.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
   1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
   2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Asphalt, Creosote, or Bituminous Surfaces to be Painted: Remove foreign particles to permit adhesion of finishing materials. Apply latex based sealer or primer.

G. Aluminum Surfaces to be Painted: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

L. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

M. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

N. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

I. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.
   1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
   2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

4. Where application method is listed in the MPI Manual for the paint system that application method is required; otherwise any application method recommended by manufacturer for material used and objects to be painted is acceptable.

J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.
   1. Number of coats and film thickness required are the same regardless of application method.
   2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
   3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

K. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
   1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
   2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
   3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
   4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.
   5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
   6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION

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SECTION 10 11 01
VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Markerboards and Tackboards.

1.03 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Blocking and supports.

B. Section 09 21 16 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

C. Section 09 91 23 - Interior Painting: Finishing of wood frame and chalkrail.

1.04 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM A424/A424M - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard, tackboard, tackboard surface covering, trim, and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Samples: Submit 3 samples 2 by 2 inch in size illustrating materials and finish, color and texture of markerboard, tackboard, tackboard surfacing, and trim.

E. Manufacturer's printed installation instructions.

F. Maintenance Data: Include data on regular cleaning, stain removal.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for chalkboard and markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Visual Display Boards:
   1. MooreCo, Inc: www.moorecoinc.com.
   2. Claridge Products and Equipment, Inc: www.claridgeproducts.com.
   3. Polyvision Corporation (Nelson Adams): www.polyvision.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 VISUAL DISPLAY BOARDS

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Color: White.
   2. Steel Face Sheet Thickness: 24 gauge, 0.0239 inch.
   3. Core: 3/8 " Particleboard, manufacturer's standard thickness, laminated to face sheet.
   4. Backing: Aluminum foil, laminated to core.
   5. Size: As indicated on drawings.

6. Frame Profile: Selected from manufacturer's standards.
7. Frame Finish: Anodized, satin.
8. Accessories: Provide map rail and marker rail, and one set of markers.

B. Tackboards: Fine-grained, homogeneous natural cork.
1. Cork Thickness: 1/8 inch.
2. Backing: Fiberboard or vinyl impregnated cork, 3/8 inch thick, laminated to tack surface.
3. Size: As indicated on drawings.
4. Frame: Extruded aluminum, with concealed fasteners.
5. Frame Profile: Selected from manufacturer's standards.
6. Frame Finish: Anodized, natural.
7. Accessories: Provide map rail.

2.03 MATERIALS

A. Porcelain Enameled Steel Sheet: ASTM A424/A424M, Type I, Commercial Steel, with fired-on vitreous finish.

B. Particleboard: ANSI A208.1; wood chips, set with waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.005 inch thick.

2.04 ACCESSORIES

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork insert and runners for accessories; 1 inch wide overall, full width of frame.

B. Marker Tray: Aluminum, manufacturer's standard profile, one piece full length of chalkboard, molded ends, concealed fasteners, same finish as frame.

C. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

3.03 CLEANING

A. Clean board surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Room and door signs.

B. Building identification signs.

C. Plaque.

1.03 RELATED REQUIREMENTS

A. Section 26 51 00 - Interior Lighting: Exit signs required by code.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect Engineer at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect Engineer prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.08 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flat Signs:
   1. Archway Graphics; 501-224-0227; http://www.archwaygraphic.com/.
   2. Inpro: www.inprocorp.com.
   3. Mohawk Sign Systems, Inc: www.mohawksign.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Dimensional Letter Signs:
   1. Cosco Industries; Cast Aluminum: www.coscoarchitecturalsigns.com.
   2. Inpro: www.inprocorp.com.

C. Plaques:
   1. Mattheus International Corporation, Bronze Division, Pittsburg, PA; www.matthewsbronze.net.
   2. Gemini Incorporated; www.signletters.com.
   3. Innerface Sign Systems, Inc.; www.interfacesign.com.

2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs:
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: As indicated.
   4. Sign Height: As indicated.
   5. Classroom and Office Doors: Identify with room names and numbers to be determined later, not those shown on the drawings; in addition, provide "window" section for replaceable occupant name.
   6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings.
   7. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
   8. Specialty Signs: Size and braille, as indicated.
   9. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN" and "FAMILY RESTROOM" room numbers to be determined later, and braille.

C. Building Plaque: Cast aluminum.

D. Building Identification Signs:
   1. Use individual metal letters.
   2. Mount on outside wall in location shown on drawings.

E. Plaque:
   1. Cast Aluminum

2.03 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: To be selected from manufacturer's standard color line.
   4. Character Color: Contrasting color, to comply with ADA.

2.04 PLAQUES

A. Metal Plaques:
   1. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects.
      a. Plaque Material: Aluminum.
      b. Background Texture: Leatherette, oxidized and coated with clear laquer finish.
      c. Border Style: Raised single line bevel border.
      d. Border Face: Polished.
      e. Mounting: Concealed fasteners, noncorroding for substrates encountered.
      f. Size: 24 inches high by 36 inches wide.
      g. Character Finish: Polished face.
      h. Character Style: Helvetica.
      i. Text: As approved by Owner. Allow for 400 uppercase and lowercase characters and numbers.

2.05 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Metal: Aluminum casting.
   2. Mounting: Concealed screws.

2.06 STAINED CONCRETE MEDALLION AND PRECAST CONCRETE RELIEF

A. Approximately 10 ft diameter; design and text to determined later.

2.07 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Locate signs where indicated:
   1. Room and Door Signs: Locate on wall at latch side of door.
   2. If no location is indicated obtain Owner's instructions.

E. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

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SECTION 10 21 13.19
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Solid plastic toilet compartments.

B. Urinal and vestibule screens.

1.03 RELATED REQUIREMENTS

A. Section 10 28 00 - Toilet Accessories.

1.04 REFERENCE STANDARDS

1.05 ADMINISTRATIVE REQUIREMENTS

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 4" x 4" inch in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 SOLID PLASTIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), floor-mounted, overhead braced.
   1. Color: As Indicated on drawings.

B. Doors:
   1. Thickness: 1 inch.
   2. Width: 24 inch.
   3. Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: 55 inch.

C. Panels:
   1. Thickness: 1 inch.
   2. Height: 55 inch.

D. Pilasters:
   1. Thickness: 1 inch.
   2. Width: As required to fit space; minimum 3 inch.

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets.

2.02 ACCESSORIES

A. Pilaster Brackets: Polished stainless steel.

B. Wall Brackets: Continuous type, polished stainless steel.

C. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.

D. Hardware: Polished stainless steel:
   1. Continuous brackets and strikes - Aluminum.
   2. Door Latch: Slide type with exterior emergency access feature.

3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
4. Coat hook with rubber bumper; one per compartment, mounted on door.
5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 ADJUSTING

END OF SECTION

SECTION 10 26 01

CORNER GUARDS AND RIGID VINYL SHEET

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Corner guards.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Verification Samples: Submit two samples showing color and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Corner Guards:
   1. Basis of Design: Inpro; Surface Mount Corner Guard Model 160 BN: www.inprocorp.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Corner Guards - Surface Mounted: Extruded one-piece unit without splices, installed with adhesive.
   1. Material: Polyvinyl chloride, rigid; textured surface. No plasticizers may be used.
   2. Width of Wings: 2 inches.
   3. Styles: Provide 90 degree corners.
   4. Color: As scheduled.
   5. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with 1.
   6. Products:
      a. Inpro Rigid Vinyl Surface Mounted Corner Guards, Model 160 BN. Color as indicated on Finish Schedule.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. End Wall Guard - Surface Mounted: Extruded one-piece unit without splices, installed with adhesive.
   1. Material: Polyvinyl chloride, rigid; textured surface. No plasticizers may be used.
   2. Styles: Provide 90 degree corners.
   3. Color: As scheduled.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on Drawings.

3.02 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

3.03 SCHEDULE

END OF SECTION

SECTION 10 28 00
TOILET ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Accessories for toilet rooms, showers, and utility rooms.

B. Grab bars.

1.03 RELATED REQUIREMENTS

A. Section 06 10 00 Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.

B. Section 10 21 13.19 - Plastic Toilet Compartments.

1.04 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

C. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

F. ASTM C1036 - Standard Specification for Flat Glass; 2011.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

H. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).

I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Samples: Submit two samples of each accessory, illustrating color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Toilet Accessories:
   1. AJW Architectural Products: www.ajw.com.
   2. ASI - American Specialties, Inc: www.americanspecialties.com.
   3. Bradley Corporation: www.bradleycorp.com.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Stainless Steel Sheet: ASTM A666, Type 304.

C. Stainless Steel Tubing: ASTM A269/A269M, Type 304 or 316.

D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Adhesive: Two component epoxy type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: No. 4 Brushed finish, unless otherwise noted.

B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

2.04 TOILET ROOM ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.
   1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
   2. Tempered Glazing.
   3. Size: As indicated on Drawings.
   4. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   5. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   6. Product: B-165 1836 manufactured by Bobrick.

B. Mirrors: Stainless steel channel framed, 1/2 inch thick with mitered corners. 1/4 inch tempered glazing.
   1. Size: As indicated on Drawings.
   2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
   4. Product: B-1658 manufactured by Bobrick.

C. Grab Bars: Stainless steel, nonslip grasping surface finish.
   1. Standard Duty Grab Bars:
      a. Push/Pull Point Load: 250 pound-force, minimum.
      b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
      c. Length, Model Numbers, and Configuration: As indicated on drawings.

D. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
   1. Product: B-254 manufactured by Bobrick.

E. Sanitary Napkin Disposal Unit: Stainless steel, Partition Mounted.
   1. Product: B-354 manufactured by Bobrick.

F. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
   1. Style: Horizontal.
   2. Material: Polyethylene.
   3. Mounting: Surface.
   4. Color: Gray.
   5. Minimum Rated Load: 250 lbs.
   6. Manufacturers:
      a. Basis of Design: Koala Kare Products; KB-200: www.koalabear.com.
      b. Substitutions: 01 60 00 - Product Requirements.

2.05 SHOWER ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners. Straight, as indicated on drawings.

B. Shower Curtain:
   1. Material: Standard, Super Bio-Stat 13 gauge, matte finish, with antibacterial treatment, flameproof and stain-resistant. Note: Shower curtain width and height to be coordinated with length and installation height of curtain rod.
   2. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
   3. Color: As selected from manufacturer's standard colors.

C. Robe Hook: Heavy-duty stainless steel, single-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.
   1. Product: B-6717 manufactured by Bobrick.

2.06 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
   1. Drying rod: Stainless steel, 1/4 inch diameter.
   2. Hooks: 2, 0.06 inch stainless steel rag hooks at shelf front.
   3. Mop/broom holders: 3 spring-loaded rubber cam holders at shelf front.
   4. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

3.03 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on the drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

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SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Fire department building rapid entry system.

D. Accessories.

1.03 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 91 23 - Interior Painting: Field paint finish.

1.04 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

B. FM (AG) - FM Approval Guide; current edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.

D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.

C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.06 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Amerex: www.amerex-fire.com.
   2. JL Industries, Inc: www.jlindustries.com.
   3. Nystrom, Inc: www.nystrom.com.
   4. Strike First Corporation of America; ABC-Seamless Steel Fire Extinguisher: www.strikefirstusa.com.
   5. Potter-Roemer: www.potterroemer.com.
   6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. JL Industries, Inc: www.jlindustries.com.
   2. Larsen's Manufacturing Co: www.larsensmfg.com.
   3. Potter-Roemer: www.potterroemer.com.
   4. Strike First Corporation of America: www.strikefirstusa.com.

5. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
   2. Provide Bi-lingual labels.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gage.
   1. UL-rated 4A:60B:C minimum, 10-lb nominal capacity.
   2. Finish: Baked polyester powder coat, color as selected.

2.03 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch thick base metal.

C. Fire Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8 inch thick fire barrier material.

D. Cabinet Configuration: Recessed type.
   1. Size to accommodate accessories.
   2. Trim: Returned to wall surface, with ADA maximum 4 inch projection, 1-1/2 inch wide face.
   3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

E. Door: 0.036 inch thick, reinforced for flatness and rigidity; recessed latch, unless otherwise indicated. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon catch.

F. Door Glazing: Float glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.
   1. Vertical Duo type with glazing.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

H. Weld, fill, and grind components smooth.

I. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

J. Finish of Cabinet Interior: White enamel.

2.04 FIRE DEPARTMENT RAPID ENTRY SYSTEM

A. Locate as indicated, or if not indicated as directed by Architect Engineer and acceptable to the Authorities Having Jurisdiction.

2.05 ACCESSORIES

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

B. Extinguisher Theft Alarm: Battery operated alarm, minimum 10 second delay for disarming, activated by opening cabinet door.

C. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect Engineer.

D. Cabinet Signage: As required by AHJ and Architect Engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, mounting height as required by Authorities Having Jurisdiction for ADA Accessibility Guidelines from finished floor to the carrying handle.

C. Secure rigidly in place.

D. Place extinguishers in cabinets, unless otherwise indicated.

3.03 SCHEDULES

A. Corridors: Cabinets with multipurpose dry-chemical type extinguisher at locations indicated.

END OF SECTION

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SECTION 10 51 00
LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lockers.

B. Locker benches.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking and nailers.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on locker construction, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

D. Samples: Submit two samples 12 by 12 inches in size, of each color scheduled.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Lockers:
   1. Art Metal Products: www.artmetalproducts.com.
   2. Penco Products, Inc: www.pencoproducts.com.
   3. Republic Storage Systems Co: www.republicstorage.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LOCKER APPLICATIONS

A. Student Lockers: Two tier metal lockers, wall mounted with matching closed base.
   1. Width: 12 inches.
   2. Depth: 12 inches.
   3. Height: 72 inches.
   4. Fittings: Hat shelf, 2 coat hooks.
   5. Locking: Built-in combination locks.
   6. Provide sloped top.

B. Locker Benches: Stationary type; bench top of solid high density polyethylene (HDPE); painted steel pedestals.
   1. Height: As indicated on Drawings.
   2. Length: As indicated on Drawings.

2.03 METAL LOCKERS

A. Lockers: Factory assembled, made of formed sheet steel, ASTM A653/A653M SS Grade 33/230, with G60/Z180 coating, stretcher leveled; metal edges finished smooth without burrs; baked enamel finished inside and out.
   1. Where ends or sides are exposed, provide flush panel closures.
   2. Provide filler strips where indicated, securely attached to lockers.
   3. Color: To be selected by Architect Engineer; allow for contrasting colors for locker bodies and doors.

B. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.
   1. Body and Shelves: 24 gage, 0.0239 inch.
   2. Base: 20 gage, 0.036 inch.
   3. Metal Base Height: 4 inch.

C. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.
   1. Door Frame: 16 gage, 0.0598 inch, minimum.
   2. Provide ventilation slots in top and bottom of door frame.

D. Doors: Hollow double pan, sandwich construction, 1-3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.
   1. Door Outer Face: 18 gage, 0.0478 inch, minimum.
   2. Door Inner Face: 20 gage, 0.0359 inch, minimum.
   3. Form recess for operating handle and locking device.
   4. Provide ventilation slots in top and bottom of door.

E. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.
   1. Hinge Thickness: 14 gage, 0.0747 inch.

F. Sloped Top: 20 gage, 0.0359 inch, with closed ends.

G. Trim: 20 gage, 0.0359 inch.

H. Coat Hooks: Stainless steel or zinc-plated steel.

I. Number Plates: Provide oval shaped brass plates. Form numbers ____ inch high of block font style with ADA designation, in contrasting color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Place and secure on prepared base.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

SECTION 10 75 00
FLAGPOLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Aluminum Flagpoles - LOCATION TO BE DETERMINED.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete base and foundation construction.

1.04 REFERENCE STANDARDS

A. ASTM B241/B241M - Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube; 2012.

B. NAAMM FP 1001 - Guide Specifications for Design Loads of Metal Flagpoles; 2007.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pole, accessories, and configurations.

C. Shop Drawings: Indicate detailed dimensions, base details, anchor requirements, and imposed loads.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

B. Protect flagpole and accessories from damage or moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Flagpoles:
   1. American Flagpole: www.americanflagpole.com.
   2. Concord Industries, Inc: www.concordindustries.com.
   3. Pole-Tech Co., Inc: www.poletech.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLAGPOLES

A. Flagpoles: Aluminum.
   1. Design: Cone tapered.
   2. Mounting: Ground mounted type.
   3. Outside Butt Diameter: 7 inches.
   4. Outside Tip Diameter: 4 inches.
   5. Nominal Wall Thickness: 0.188 inches.
   6. Nominal Height: 35 ft; measured from nominal ground elevation.
   7. Halyard: External type.

B. Performance Requirements:
   1. Wind Pressure Loading on Flagpole with Flag: Resistant without permanent deformation to 110 miles/hr wind speed, in accordance with NAAMM FP 1001; the factor of safety used is 2.5.

2.03 POLE MATERIALS

A. Aluminum: ASTM B241/B241M, 6063 alloy, T6 temper.

2.04 ACCESSORIES

A. Finial Ball: Stainless steel, 6 inch diameter.

B. Truck Assembly: Cast aluminum; revolving, stainless steel ball bearings, non-fouling.

C. Flags shall be provided by Owner. Not in Contract.

D. Cleats: 9 inch size, aluminum with galvanized steel fastenings, two per halyard.

E. Halyard: 5/16 inch diameter polypropylene, braided, white.

2.05 OPERATORS

A. Hand Crank.

2.06 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M 36M, corrugated 16 gage, 0.0598 inch steel, galvanized, depth

B. Lighting Ground Rod: 120 inch long copper rod, 3/4 inch diameter.

C. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.07 FINISHING

A. Aluminum: Clear Satin Anodized.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

3.03 INSTALLATION

A. Install flagpole, base assembly, and fittings in accordance with manufacturer's instructions.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1 inch.

3.05 ADJUSTING

A. Adjust operating devices so that halyard and flag function smoothly.

END OF SECTION

SECTION 11 40 00
KITCHEN EQUIPMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

A. The drawings and general provisions of the contract, including general and supplementary conditions and general documents, apply to the work specified in this section.

1.02 SCOPE OF WORK

A. Include all labor, materials, and freight required to deliver, install, set in place, level, hang hood(s), erect walk in(s), run refrigeration line(s), etc. for the equipment specified in this section.

1.03 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Recessed and raised floor areas including reinforced concrete wearing bed and specified floor material with coved corner bases inside walk-ins by Division 03 00 00.

B. Millwork not specified in this section is to be provided under Division 06 00 00.

C. Rough-in, final connection, indirect drains, drain traps, grease traps, steam traps, PVC for drink lines, strainers, water coolers, hand sinks, mop sinks, tailpieces, valves, stops, shut off valves, pipes, line strainers, atmospheric vents, pipe fittings, ventilators, duct work, exhaust and supply fans, disconnection and reconnection of existing equipment and all materials not specified in this section are to be provided and installed by Division 22 00 00 and Division 23 00 00.

D. Rough-in, final connection, lines, disconnect switches, safety cut off, fittings, outlets, convenience outlets, pull boxes, wiring, conduit, junction boxes, fuse boxes, control panels, starters, shunt trip breakers (required for the shut off of all electrical outlets under the ventilator and shut off of ventilator fan(s) in the event the fire suppression systems is activated), contactors, disposer and walk-in control wiring, inter connection of fire suppression system with building alarm, disconnection and reconnection of existing equipment and all materials not specified in this section are to be provided and installed by Division 26 00 00, Division 27 00 00 and Division 28 00 00.

1.04 FEES, LICENSES, INSPECTION, PERMITS AND TAXES

A. Pay all fees, licenses, inspections, permits and taxes required by state and local authorities for the equipment specified in this section and furnish receipts for same.

1.05 JURISDICTIONS, TRADE AGREEMENTS AND RESTRICTIONS

A. Portions of this work may be sub-contracted to those qualified to do such work as may be required because of jurisdictional trade agreements and restrictions.

1.06 QUALITY ASSURANCE

A. Submit evidence to the owner, architect and consultant of qualifications listed below:
   1. Successful completion of projects of comparable size and scope.
   2. Maintain a staff experienced in the installation of Kitchen Equipment and the preparation of professional drawings and brochures.

1.07 SUBSTITUTIONS

A. It is the purpose of these plans and specifications to purchase for the owner equipment that conform to the best existing policies of the commercial kitchen equipment Industry. These items have been selected as preferred items as a result of past experiences, functional design, construction, material, maintenance and repair. If a contractor elects to quote on substitutions not specified, they will be permitted to do so provided that they list these substitutions on a separate form (do not use alternates in the base bid unless pre approved) outlining them as additions or deductions to the specified brand. Any contractor offering a substitution shall accompany the bid with complete construction details, and specification sheets.

B. If a proposed substitution is accepted the kitchen equipment contractor shall provide and pay for all changes to, space, structure, utilities, construction, professional services, modify other items, provide rough in drawings, specifications, etc. that may be required.

1.08 INTERPRETATION OF DOCUMENT

A. The specifications and drawings are complementary and what is called for by one shall be binding as if called for by both. Contractors shall examine the full set plans and specifications to be fully satisfied as to the conditions of the project. No allowance shall be subsequently made to the contractor by reason of error on his part or obvious oversight not called to the attention of the Owner, Architect, General Contractor and Consultant.

B. Questions regarding specifications and drawings will be responded to by written addendum only.

1.09 WARRANTIES

A. Warranties for parts and labor in writing for all new Kitchen Equipment for a period of one year from date of acceptance.

B. Refrigeration system compressors shall be warranted for an additional four years by the manufacturer.

C. Provide at no cost to owner, refrigeration service including freon, mileage, parts and labor to all refrigeration equipment within 24 hours of notification for one year from date of acceptance.

1.10 REGULATIONS AND CODES

A. Comply with all applicable laws, statues, building codes, regulations of state, local, public authorities and comply with the following:
   1. National Sanitation Foundation.
   2. National Fire Protection Association.
   3. Underwriter's Laboratories, Inc.
   4. Factory Mutual.
   5. Building Official and Code Administrators.
   6. National Electrical Code.
   7. American Gas Association Labs.
   8. Occupational Safety and Health Act.
   9. National Electrical Manufactures Association.
   10. Americans with Disabilities Act.
   11. American National Standards Institute.
   12. American Society of Mechanical Engineers.

1.11 SUBMITTALS

A. Kitchen equipment contractor shall review rough-in drawings provided and notify the Architect, Consultant and Construction Manager or General Contractor in writing with in 15 days of any utility changes required for the equipment. Submit in thirty days dimensioned drawings showing all Kitchen Equipment items with itemized schedules, mechanical rough-in, electrical rough-in and critical conditions plan.

B. Submit in thirty days dimensioned drawings showing complete construction details of all fabricated equipment.

C. Submit in thirty days brochures of regularly manufactured items with project label, project cover sheet, item cover sheet, and specification sheet.

D. Submit number and type drawings as requested by the owner, architect, consultant and general contractor.

E. Submit in thirty days material samples with manufacturer's name plate and item number for review to the Owner, Architect, Consultant and Construction Manager or General Contractor.

F. Submit prior to kitchen equipment demonstration operation/instruction manuals with item cover sheet (indicate on item cover sheet for the kitchen equipment, make, model number, serial number and local service agency with address and phone number for the project location) and copy of manufacturer's operation and instruction manual.

G. Provide pictures of completed punch list deficiencies to Contractor, Architect Owner and Consultant for review after all punch list work has been completed.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver any Kitchen Equipment to the project until advised and building is weather and vandal safe.

1.13 JOB CONDITIONS

A. Before ordering Kitchen Equipment and starting work verify measurements at job site. Be responsible for fitting Kitchen Equipment into space provided. No extra charge or compensation will be allowed for minimal difference between dimensions indicated and actual field dimensions.

B. Verify that Kitchen Equipment will fit through openings provided.

C. Prior to ordering Kitchen Equipment verify all mechanical and electrical utilities available at the project site and coordinate.

1.14 SCHEDULING

A. Coordinate and schedule delivery and installation of Kitchen Equipment so as not to impede project construction schedule. Coordinate number of days required for equipment installation with owner and general contractor.

PART 2 – PRODUCT

2.01 MATERIALS

A. United States standard gauge 18-8, type 302, not over .012% maximum carbon stainless steel with a number 4 finish.

B. Armco Galvanized Steel.

2.02 MANUFACTURED EQUIPMENT

A. Standard finishes and accessories unless specifically deleted. Options shall be by same manufacturer.

B. Follow the manufactures installation instructions.

C. All equipment for high altitude operation, elevation approximately 7200 feet above sea level.

2.03 FABRICATION

A. General
   1. Provide fabricated Kitchen Equipment as specified.
   2. Fabricated by one manufacture with consistent construction for like items.
   3. Grind all welds of stainless steel smooth and polish to a number 4 finish.
   4. Use concealed type bolts to fasten trim to paneling and body of equipment, and secure to exposed sheet metal surface.
   5. Use stainless steel bolts and screws.
   6. Where threads of bolts and screws occur on inside of fixtures, are visible, or might come in contact with a wiping cloth, cover screw with washer and stainless steel acorn nut.
   7. Do not use rivets to fasten body paneling together.

B. Sound deadening
   1. Provide Schnee Butyl-Sealant ½” wide rope as a sound deadening material between all metal surfaces and tighten bolts for maximum compression of sealant.

C. Painting
   1. Non-stainless steel finishes painted two coats of hammer tone gray, air-dried.
   2. Oven baked finishes for 2 hours at a minimum temperature of 300º F.

D. Stainless Steel Tops
   1. 14 gauge stainless steel tops with one piece fully welded construction. Free edges turned down 2” and back on slight angle ½” with corners fully welded, ½” high marine edge with fully welded corners or as detailed, indicated and specified.

2. Where tops fit adjacent to equipment, walls and columns cove up to specified height and back on 45º angle or as specified forming a back splash and Zee clip to wall, unexposed. Enclose ends of back splashes, extending full length of fixture including rolls.
3. Reinforce underside of tops with fully welded 14 gauge stainless steel angle and channel framework of suitable size and at locations as required to hold top flat and support heavy loads without deflection. Provide two hat channels to support drawer assemblies, enclosed bases and leg/gusset as required.
4. Provide cross members at 30” on centers maximum. No bolts or pop rivets in tops.

E. Field Joints
1. Fully weld grind smooth and polish to a number 4 finish. Field joints in bases pull tight and cover with pilaster of same material as base. Minimum field joints required for access into building.

F. Coved Corners
1. Vertical and horizontal corners coved on a ¾” radius and cove at intersections.

G. Enclosed Bases
1. 18 gauge stainless steel formed flat approximately 1” on bottom then formed up to the underside of the top then formed flat approximately 1” to the inside of the cabinet and formed down approximately ½” to create a rigid structure with all seams fully welded, ground smooth and polished. Front rails, mullions, and other components to provide appearance of one piece construction fully welded seamless with no open cracks or ledges.
2. 18 gauge stainless steel U channel filler behind mullions weld in place grind smooth and polish.

H. Legs & Cross rails
1. 1 5/8” outside diameter, 16 gauge stainless steel tubing, fully welded at cross rails, ground smooth, and polished.
2. Fit leg with adjustable stainless steel bullet or flange foot with holes secured to floor with non corrosive anchors.
3. Open base legs fit at top with stainless steel gusset welded 360 degrees to underbracing.

I. Under shelves
1. 18 gauge stainless steel shelves in enclosed bases, turn rear and ends up with a hug edge, fully weld corners grind smooth and polish. Flush shelf with base fully weld, grind smooth and polish.
2. 18 gauge stainless steel shelves in open based, free sides turn down 2” and back ½ “, at wall or tall equipment turn up 2” with corners notched and fully welded to legs, grind smooth and polish .

J. Casters
1. NSF, 5” diameter, polyurethane, all swivel, top operated foot brake, zerk grease fitting, and to support 300 pound load.

K. Drawers
1. Component Hardware S90-0020*M126 with four sided 14 gauge stainless steel frame fully welded corners, flange top in, and bolt to hat channels. S90-0015*M126 for smaller spaces.
2. Provide cylinder locks when specified in itemized specifications, all keyed alike.

L. Sinks and Drain boards
1. 14 gauge stainless steel fully welded construction with all corners coved on ¾” radius.
2. Double wall partitions between sink compartments.
3. Slope drain boards to sink compartment.
4. Crease bottom of sink for proper drainage.
5. Drain boards constructed integral with sink compartments.
6. Fisher 22411*M126 drain with 14 gauge stainless steel bracket.
7. T & S B-231*M126 faucet.

M. Over Shelves
1. 18 gauge stainless steel fully welded construction, form as specified for tops, provide stainless steel underbracing as required to support shelf without deflection turn up 2” at wall and equipment.
2. Table mounted shelves mounted on 1” tubing, 16 gauge stainless steel tubing fully welded to top or back splash.
3. Wall mount shelves on 14 gauge stainless steel brackets attached to wall with stainless steel screws.

2.04 SCHEDULE OF EQUIPMENT

A. Item 1 to 1E - Walk in cooler / freezer and refrigeration systems - one required
1. Thermo-kool.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
a. Meet all 2016 Paris Climate Agreement and 2009 Federal Energy Saving Standards.
b. NSF certified construction and components. Bear NFS seal.
c. Non standard size to fit the space, install walk in walls 2” off building walls, field verify all measurements.
d. 0.040 embossed aluminum exterior.
e. 0.040 embossed aluminum interior.
f. Trim openings on sides (at walls) with exterior material angles neatly attached with stainless steel screws.
g. Trim openings on top (at free sides) with exterior material, lift off, removable, enclosure panels attached with stainless steel screws.
h. 4” thick zero ozone depleting urethane insulation foamed in place and bonded to all interior surfaces of panels. All panels R-32.
i. 5“ thick roof panels.
j. Three “Insta-Loks” cam locks for each wall panel.
k. 8’-6” high above finished floor, 8’-10” high overall.
l. Set in 4” deep recess in building floor.
m. Exterior walk in walls shall be installed 2” off building walls.
n. Kitchen equipment contractor shall furnish and install below the walk in floor 6 mil polyethylene sheeting with all seams taped water tight.
o. Kitchen equipment contractor shall furnish and install a sand leveling bed to make the walk in floor level with the building finished floor.
p. Kitchen equipment contractor during assembly of the walk in shall neatly seal unexposed in tongue and groove all floor, wall and ceiling panel seams air tight with Kason 3701 non skinning butyl sealant.
q. Dura floor foamed in place 1/8” diamond thread aluminum floor with 12,000 pounds per square foot load rating and ¾” plywood decking.
r. 14 gauge stainless steel three piece trim at top and both sides of wall opening (approximately 15” deep x 96” high, verify) to have a 4” face in kitchen with a ½” return to wall secure to wall with counter sunk stainless steel screws and stainless steel hardware.
s. 36” wide X 78” high doors with 14” x 24” view port and heated, triple pane safety glass, each door.
t. 14 gauge stainless steel thresholds shall have a 45 degree angle on both sides of the door opening, field verify measurements.
u. Thermostatically controlled heated door jamb and threshold for cooler and freezer doors.
v. Kason 1238C chrome polished latch (handle) with cylinder lock and interior glow in the dark twist off safety release, each door.
w. Kason 1094 chrome polished hydraulic closer, each door:
x. Kason 1830, 120/1, two way electrically heated pressure relief ports with finish to match the walk in. Pre wired to light fixture/junction box.

y. Weiss 25FB3-1290 2 ½" diameter chrome polished recessed dial thermometer with -40 degree C to +150 degree C dial.
z. Three Kason 1346 chrome polished performer adjustable spring loaded hinges, each door.
aa. Kason Thermalflex vinyl strip door curtains, each door.
ab. Modularm flush mounted 75LC multi monitor(s) with built in battery back up, flush mounted MD-1 motion detectors, flush mounted IP-1 illuminated push button panic switches and MC-1 magnetic door contacts pre wired into each door panel.
ac. Modularm 75LC flush mounted wireless module(s) pre wired into door panel(s).
ad. Modularm 75LC wireless communicator with built in battery back with complete system set up.
ae. Kason 1802L LED lights with frosted high impact lexan globe and LED bulbs centered over each door.
af. Simkar EN2LED4RFAF4641U1WLH 48" led lights with ribbed frosted acrylic lens, standard distribution, 46 watts, 3600 lumen, standard color, 120 volt and wet location hub option. One in cooler and one in freezer. Secured to ceiling with stainless steel hardware by Kitchen Equipment Contractor.
ag. Heatcraft QRC quick response controller built into the cooler and freezer evaporator coils with intelligent demand defrost and rapid response electronic expansion valves.
ah. 1 ½ horse power (13,150 btu) to maintain +35 degree temperature, pre-assembled remote cooler condensing unit, 208/3 with outside weatherproof cover, crankcase heater, headmaster valve, controls, pre wired disconnect and unit rated for 100 degree ambient outside air temperature. Evaporator coil, 120/1.
ai. 3 horse power (10,700 btu) to maintain -10 degree temperature, pre-assembled remote freezer condensing unit, 208/3 with outside weatherproof cover, crankcase heater, headmaster valve, controls, pre wired disconnect and unit rated for 100 degree ambient outside air temperature. Evaporator coil, 208/1, wire drain line heat tape to evaporator coil.
aj. Raychem H622250, 208/1, self regulating drain line heat tapes with connection kits and H912 gel fill end seal kits. Heat tape of sufficient length and installed to prevent freezing of walk in drain line.
ak. Install condensers air intake side 42" minimum from wall(s) exhausting to open area with 48" clear on exhaust side. Set units 36" minimum from each other end to end. Do not install where other heat generating equipment can exhaust onto the walk in condensers.
al. Fabricated 24" high fully welded stainless steel rack for each condensing to set on with 14 gauge stainless steel solid top, 12 gauge angle channels and legs with tabs at bottom for securing rack to mounting location with non corrosive anchors. If roof/curb mounted set units on treated 4" x 4" runners. Secure condenser frame to rack or 4" x 4" runners with non corrosive anchors.
am. When 4" x 4" runners are setting on the vinyl roof cap provide a additional layer of the vinyl roof cap material between the vinyl roof cap and the 4" x 4" runner that the condensers set on.
an. Duro-last DL-40 white vinyl roof cap membrane, 40 mils thick, 0.22 pounds per square foot, tested according to ASTM 4434, classified type IV on free sides extend vinyl roof cap membrane down wall 8" to fully cover seam between the roof panel and top of the wall panel, secure turn down tight to wall with a fascia cover, turn roof cap up 6" at building walls and flash and counter flash with 0.040 embossed aluminum trim to form a water tight seal to the building wall. Complete installation per the manufactures instructions and details.
ao. Kitchen equipment contractor shall hang evaporator coils with nylon (only non metallic) all thread rod and stainless steel nuts and washers, seal penetrations air tight.
ap. Kitchen equipment contractor shall furnish and install copper refrigeration lines (welded) from evaporator coils to condenser, suction line insulated with 1" arma flex and liquid line insulated with ½" arma flex seal all arma flex seams air tight and seal

all panel penetrations air tight. Run lines in chase to from evaporator coil to condenser.

aq. Kitchen equipment contractor shall furnish and install 3/4" hard copper drain lines from blower coils to floor drain, slope 1/2" to 12" minimum, fully insulated with ¾" arma-flex insulation, provide clean out tees with plugs and P traps to prevent the back flow of air into freezer compartment from the cooler and from the kitchen into the cooler. Drain pipe to exit the walk in approximately 12" above finished floor, seal penetrations air tight between compartments and at exterior.

ar. Provide all components required for the complete and proper operation of the walk-in cooler and freezer for the location, region, climate, altitude, etc. of the installation.

as. Start up units, make any adjustments required and allow to run seventy-two hours prior to demonstration of other equipment.

at. 3/16" diamond thread aluminum kick plate 36" high at interior and exterior of door and interior and exterior of door panel, notch above floor base material as required.

au. 3/16" diamond thread aluminum kick plate 36" high at exposed exterior, stop kick plate 4" from walls to allow space for installation of angle trim.

av. The walk in and refrigeration systems shall be erected in the location shown on the kitchen plan. The kitchen equipment contractor will be required to disassemble, move and reinstall the walk-in (including the refrigeration system) if not set how and where shown.

aw. Internal and or external structure and all hardware required to support, fully assemble and install walk in the location shown on the plans.

ax. Kitchen equipment contractor shall seal all penetrations in the walk in panels air tight (including but not limited to outside the electrical conduit, inside the conduit around the wires, refrigeration line sets, drain pipes and sprinkler pipes, etc.) with urethane insulating foam sealant 4" thick from one side of the panel to the other without dead spaces, allow sealant to fully cure, trim excess and seal the exposed surface of the foam on both sides of the panel with grey NSF silicone sealant.

ay. Kitchen equipment contractor shall fully insulate all fire sprinkler pipe drops as required to prevent ice and condensation from forming on the pipe and dripping water on the exterior top of the walk in.

b`. Kitchen equipment contractor shall furnish loose to the electrician, sized by the electrician, non metallic conduit and fittings for all walk in panel electrical penetrations. Seal inside (around wires) of conduit air tight. Seal around the outside of the conduit air tight.

ba. Preassemble walk in at factory for a complete quality control inspection.

bb. Installation and assembly per the manufactures instructions and details.

bc. Onsite supervision and coordination for all of the utility connections.

bd. Start up, testing and calibration by factory authorized service agency.

be. Onsite demonstration by factory representative.

bf. Ten year warranty on all wall, floor and ceiling panels.

bg. One year onsite parts, service and labor warranty.

bh. Five year compressor warranty.

B. Item 2 - Walk in shelving – nine required
   1. Metro metroseal 3*M126 super erecta.
   2. Provide the following:
      a. One unit with five 14" x 60" wire shelves and four 74" high round post.
      b. Four units with five 21" x 48" wire shelves and four 74" high round post, each unit.
      c. Three units with five 21" x 60" wire shelves and four 74" high round post, each unit.
      d. One New age 2020*M126 dunnage rack.
      e. Field verify fit and adjust sizes if required.
      f. Assemble onsite with shelf spacing per owners instructions.
      g. One year onsite parts, service and labor warranty.

C. Item 3 – Dry storage shelving – seven required

1. Metro metroseal 3*M126 super erecta.
2. Provide the following:
   a. Five units with five 24” x 60” wire shelves and four 74” high round post, each unit.
   b. One unit with five 24” x 36” wire shelves and four 74” high round post.
   c. 21 CR24E*M126 can racks.
   d. One New age 2020*M126 dunnage rack.
   e. Field verify fit and adjust sizes if required.
   f. Assemble onsite with shelf spacing per owners instructions.
   g. One year onsite parts, service and labor warranty.

D. Item 4 – Ice maker – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.
2. Provide the following:
   a. Cord and plug.
   b. Cuno ICE120-S*M126 water filter.
   c. Four 6” high stainless steel legs with adjustable bullet feet.
   d. Brand is Scotsman.
   e. Installation and assembly per the manufactures instructions and details.
   f. One year onsite parts, service and labor warranty.

E. Item 5 – Pot and pan sink – one required
1. Fabricated according to details, drawings and specifications.
2. Provide the following:
   a. Built into clean dish table item 12.
   b. 14 gauge stainless steel one piece coved corner top.
   c. 2 1/2” high with a 1½” diameter semi-roll at free sides.
   d. 8” high splash from top of semi roll at walls.
   e. Weld in partition construction between bowls, NO SPLIT BOWLS ALLOWED.
   f. Three 21” X 26 1/2” X 15” deep (12” deep from table top) 14 gauge stainless steel coved corner sinks.
   g. Two approximately 30” long 14 gauge stainless steel coved corner integral drainboards.
   h. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½” and back ½” on a slight angle and at all walls turn up 2”.
   i. 14 gauge stainless steel fully welded channels, cap front.
   j. Copper flashed weld studs capped with stainless steel acorn nuts.
   k. ¾” tacky tape between all metal surfaces.
   l. Stainless steel gussets fully welded 360 degrees to channels.
   m. 1 5/8” 16 gauge stainless steel tubing legs.
   n. 1 5/8” 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
   o. Stainless steel adjustable bullet feet.
   p. Stainless steel adjustable flanged feet with two holes at all front legs secure to floor with two non corrosive anchors.
   q. Two stainless steel flanged feet with two holes at front outside corners, secure to floor with two non corrosive anchors.
   r. One T & S B-231-CR *M126 faucet with ceramic cartridges.
   s. One T & S MPZ-8WLN-08-CR mini pre rinse faucet with ceramic cartridges, 8” add on spout with pre rinse riser support bracket secured to wall with stainless steel screws.
   t. Three Fisher 22411*M126 lever handle drains with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8” maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
   u. Z clip splash to wall, unexposed.

v. 16 gauge stainless steel removable overshelf, mounted on 1 5/8" outside diameter tubing supports through splash to sockets fully welded to channels and back splash. 14 gauge stainless steel brackets, 14 gauge stainless steel channels fully welded to brackets. 2" X 3/16" stainless steel band fully weld to brackets full length. Stainless steel pot hooks 8" on centers. Mounted 72" above finished floor, verify height with owner. Free sides turned down 1 ½" and back ½" on a slight angle and at all walls turn up 2.
w. Channels shall be welded to each other with a 1" x 4" x 1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
x. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
y. One year onsite parts, service and labor warranty.

F. Item 6 – Drying rack – one required
1. Metro stainless steel *M126.
2. Provide the following:
a. One unit with four 21" x 36" 18 gauge stainless steel flat shelves and four 63" high stainless steel post. 69" high overall with casters.
b. Set of four rotating, non-marking neoprene bumpers.
c. Four 5" diameter polyurethane casters, 300 pound load capacity each caster, and two casters with brakes.
d. Assemble onsite with shelf spacing per owners instructions.
e. One year onsite parts, service and labor warranty.

G. Item 7 – Booster heater – one required
1. Provided and installed by vendor, if used.
2. Kitchen equipment contractor shall coordinate installation with kitchen equipment.

H. Item 8 – Dishwasher vent – one required
1. Captive aire VHB-G*M126.
2. Provide the following:
a. 18 gauge 304 stainless steel fully welded liquid tight construction.
b. Four sided condensate gutter.
c. Drain with plug at rear corner on soiled dishtable side.
d. Pipe drain to floor sink or floor drain with copper tubing.
e. 18 gauge 304 stainless steel, removable enclosures panels to finished ceiling, DO NOT WELD TO HOOD, enclosure panels shall be obtained from Captive aire as part of the hood no exceptions. Verify ceiling height.
f. Enclosure panel mounting channel on top of hood at all free sides.
g. Hang with 1/2" all thread rod, uni-strut, 1/2" beam clamps, nuts, washers, etc. to prevent sway or movement. Secure and or weld to structure with other braces as required to prevent movement of hood once hung.
h. All fans, ductwork, electrical final connections, etc. by others.
i. Electrical contractor shall wire exhaust fan to interlock on dishwasher so fan will run only while dishwasher is running.
j. Installation and assembly per the manufactures instructions and details.
k. Onsite supervision and coordination for all of the utility connections.
l. Start up, testing and calibration by factory authorized service agency.
m. Onsite demonstration by factory representative.
n. One year onsite parts, service and labor warranty.

I. Item 9 – Soiled dishtable – one required
1. Fabricated according to details, drawings and specifications.
2. Provide the following:
a. 14 gauge stainless steel one piece coved corner top.
b. 3" high with a 1½" diameter semi-roll at free sides.

c. 10” high splash at walls.
d. 14 gauge stainless steel fully welded channels, cap front.
e. Copper flashed weld studs capped with stainless steel acorn nuts.
f. ¾” tacky tape between all metal surfaces.
g. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½” and back ½” on a slight angle and turn up 2” at walls.
h. 21” X 21” X 5” deep 14 gauge stainless steel coved corner pre-rinse sink with removable perforated 16 gauge stainless steel scrap basket and 1” round stainless steel tubing rack runners fully welded to basket.
i. Fisher 22411*M126 lever handle drain with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8” maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
j. Marine edge at pass through opening extending 2” in to dining room, close both ends (at top and bottom) and 4” face to cover sill opening. 14 gauge stainless steel trim in dishroom and channel to support top.
k. Die stamped raised edge opening in top for Component J92-5000 scrap block.
l. Notch splash for roll up door track, as required and coordinate. Hold track 1” above table top.
m. 14 gauge stainless steel control bracket, set face of control back 2” of inside of semi roll. Secure bracket to top with studs capped with stainless steel acorn nuts.
n. Stainless steel gussets fully welded 360 degrees to channels.
o. 1 5/8” 16 gauge stainless steel tubing legs.
p. 1 5/8” 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
q. Stainless steel adjustable bullet feet.
r. Stainless steel adjustable flanged feet with two holes at all front legs secure to floor with two non corrosive anchors.
s. Z clip splash to walls, unexposed.
t. T & S B-133-CR-B08C*M126 pre rinse faucet with ceramic cartridges and riser support secured to wall with stainless steel screws.
u. Channels shall be welded to each other with a 1” x 4” x 1” continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
v. 14 gauge stainless steel soak sink (21” x 21” max inside) sized for a standard dish rack with stainless steel legs and gussets, Fisher 22411*M126 lever handle drain with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8” maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
w. 14 gauge stainless steel silverware chute with flange in dinning room and 14 gauge stainless steel trim ring at wall opening in dish room, hem exposed edges of chute. Provide water tight diverter in dishroom at bottom to direct silverware into the soak sink. Wall opening by respective trade, General Contractor.
x. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
y. One year onsite parts, service and labor warranty.

J. Item 10 – Not used

K. Item 11 – Dishwasher – one required
1. Provided and installed by vendor.
2. Kitchen equipment contractor shall coordinate installation with kitchen equipment.

L. Item 12 – Clean dishtable – one required

1. Fabricated according to details, drawings and specifications.
2. Provide the following:
   a. See pot sink item 5.
   b. 14 gauge stainless steel one piece coved corner top.
   c. 3” high with a 1½” diameter semi-roll at free sides.
   d. 10” high splash at walls.
   e. 14 gauge stainless steel fully welded channels, cap front.
   f. Copper flashed weld studs capped with stainless steel acorn nuts.
   g. ¾” tacky tape between all metal surfaces.
   h. Weld in partition construction between bowls, NO SPLIT BOWLS ALLOWED.
   i. Three 21” X 26 X 15” deep (12” from table top) 14 gauge stainless steel coved corner sink.
   j. One approximately 30” long 14 gauge stainless steel coved corner integral drainboard.
   k. One T & S B-231-CR *M126 faucet with ceramic cartridges.
   l. One T & S MPZ-8WLN-08-CR mini pre rinse faucet with ceramic cartridges, 8” add on spout with pre rinse riser support bracket secured to wall with stainless steel screws.
   m. Fisher 22411*M126 lever handle drain with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8” maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
   n. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½” and back ½” on a slight angle and turn up 2” at walls.
   o. Stainless steel gussets fully welded 360 degrees to channels.
   p. 1 5/8” diameter 16 gauge stainless steel tubing legs.
   q. 1 5/8” diameter 16 gauge stainless steel crossrails fully welded 360 degrees to legs.
   r. Stainless steel adjustable bullet feet.
   s. Stainless steel flanged feet with two holes at all front legs, secure to floor with two non corrosive anchors.
   t. 16 gauge stainless steel removable overshelf, mounted on 1 5/8” outside diameter tubing supports through splash to sockets fully welded to channels and back splash. 14 gauge stainless steel brackets, 14 gauge stainless steel channels fully welded to brackets. 2” X 3/16” stainless steel band fully weld to brackets full length. Stainless steel pot hooks 8” on centers. Mounted 72” above finished floor, verify height with owner. Free sides turned down 1 ½” and back ½” on a slight angle and at all walls turn up 2.
   u. Channels shall be welded to each other with a 1” x 4” x 1” continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
   v. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
   w. Z clip splash to walls, unexposed.
   x. One year onsite parts, service and labor warranty.

M. Item 13 – Milk cooler – two required
   1. Provided and installed by vendor.
   2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

N. Item 14 – Tray lowerator or cart – six required
   1. Provide the following:
      a. Four Piper PT/1014MO*M126 with four 4” polyurethane casters two with brakes, obtain size and sample of owner’s tray prior to ordering and coordinate.
      b. Two Lakeside 522*M126 carts.
      c. One year onsite parts, service and labor warranty, each unit.

O. Item 15 – Hot food counter – one required
   1. Duke TEHF-60DSS*M126.
   2. Fabricated according to details, drawings and specifications.
   3. Provide the following:
      a. 120-208/1 with cord and plug, each unit.
      b. Lights and hot wells wired to one cord and plug, each unit.
      c. 14 gauge stainless steel top, each unit.
      d. Top and tray side seamless with item 17, each unit.
      e. Field welding, grinding smooth and polishing required due to manufactures limitations.
      f. 34” deep top and 34” high to counter top, each unit.
      g. 900 watt sealed hot food wells with manifold drains and ¼ turn drain valve*M126, each unit.
      h. Drain valve handle to extend to face of base on operators side, each unit.
      i. Stainless solid steel tray slides mounted on stainless steel fold down brackets, each unit.
      j. Stainless steel base front, rear and both ends.
      k. Plastic laminated on base front with non-standard color and pattern to be selected by Architect and Owner, each unit.
      l. TS540*M126 series guard full length with 18 gauge stainless steel top and ends, full length fluorescent lights (lights and hot wells wired to one cord and plug), each unit.
      m. Stainless steel legs and feet*M126, each unit.
      n. Installation and assembly per the manufactures instructions and details.
      o. Onsite supervision and coordination for all of the utility connections.
      p. Start up, testing and calibration by factory authorized service agency.
      q. Onsite demonstration by factory representative.
      r. One year on site parts, service and labor warranty, each unit.

P. Item 16 – Cold food counter – one required
   1. Duke HB4CM-N7*M126.
   2. Fabricated according to details, drawings and specifications.
   3. Provide the following:
      a. 14 gauge stainless steel top.
      b. 34” high to top.
      c. 120/1 with cord and plug set cold pan and lights wired to one cord and plug.
      d. Stainless steel base front, rear and both ends.
      e. Stainless solid steel tray slides mounted on stainless steel fold down brackets each side.
      f. Plastic laminated on base front, rear and both ends with non-standard color and pattern to be selected by Architect and Owner.
      g. TS530*M126 double sided self service buffet style sneeze guard full length with stainless steel frame and top, full length fluorescent lights.
      h. End glasses on sneeze guard.
      i. Stainless steel legs and feet*M126.
      j. Condensate evaporator.
      k. NSF 7 cold pan.
      l. False bottom full length, removable.
      m. 8” deep liner.
      n. Installation and assembly per the manufactures instructions and details.
      o. Onsite supervision and coordination for all of the utility connections.
      p. Start up, testing and calibration by factory authorized service agency.
      q. Onsite demonstration by factory representative.
      r. One year onsite parts, service and labor warranty.
      s. Five year compressor warranty.

Q. Item 17 – Flat top counter – one required

1. Duke TST-32DSS*M126.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
   a. 14 gauge stainless steel top.
   b. Top and tray side seamless with item 15.
   c. 34” deep top and 34” high to counter top.
   d. Stainless solid steel tray slides mounted on stainless steel fold down brackets.
   e. Stainless steel base front, rear and both ends.
   f. Plastic laminated on base front with non-standard color and pattern to be selected by Architect and Owner.
   g. Omit intermediate under shelf.
   h. Stainless steel legs and feet*M126.
   i. Installation and assembly per the manufactures instructions and details.
   j. Onsite supervision and coordination for all of the utility connections.
   k. Start up, testing and calibration by factory authorized service agency.
   l. Onsite demonstration by factory representative.
   m. One year on site parts, service and labor warranty.

R. Item 18 – Not used

S. Item 19 – Baker’s table – one required
   1. Fabricated according to details, drawings and specifications, 34” high to top.
   2. Provide the following:
      a. 14 gauge stainless steel one piece coved corenr top.
      b. 8” high splash at walls.
      c. Top turned down 1½” and back ½” on a slight angle on all free sides.
      d. Copper flashed weld studs capped with stainless steel acorn nuts.
      e. ¾” tacky tape between all metal surfaces.
      f. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME
      g. Two Component Hardware S90-0020-N*M126 20” drawer assembly with 18 gauge stainless steel bottom enclosure plate, secured to channels on four sided 14 gauge stainless steel fully welded frame studded to channels or top. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
      h. Stainless steel gussets fully welded to channels.
      i. 1 5/8” 16 gauge stainless steel tubing legs.
      j. 1 5/8” 16 gauge stainless steel tubing crossrails fully welded to legs.
      k. Stainless steel adjustable bullet feet.
      l. Two Rubbermaid 3601*M126 bins.
      m. 16 gauge stainless steel removable overshelf, mounted on 1 5/8” outside diameter tubing supports through splash to sockets welded to channels and back splash. 14 gauge stainless steel brackets, 14 gauge stainless steel channels fully welded to brackets. 2” X 3/16” stainless steel band fully weld to brackets full length. Stainless steel pot hooks 8” on centers. Mounted 60” above finished floor, verify height with owner. Free sides turned down 1 ½” and back ½” on a slight angle and at all walls turn up 2.
      n. Channels shall be welded to each other with a 1” x 4” x 1” continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
      o. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
      p. One year onsite parts, service and labor warranty.

T. Item 20 – 60 Quart mixer – one required
   1. Globe SP60*M126.
   2. Provide the following:
      a. 208/3.

b. Cord and plug.
c. 60 quart stainless steel bowl.
d. Aluminum spiral dough hook.
e. Aluminum flat beater.
f. Stainless steel wire whip.
g. Bowl guard with built in ingredient chute.
h. XBTRUCK-60, 60 quart heavy duty bowl truck.
i. Installation and assembly per the manufactures instructions and details.
j. Onsite supervision and coordination for all of the utility connections.
k. Start up, testing and calibration by factory authorized service agency.
l. Onsite demonstration by factory representative.
m. One year onsite parts, service and labor warranty.

U. Item 21 – Convection oven – one required
1. Blodgett DFG-100 double stack*M126.
2. Provide the following:
a. Double stack.
b. Natural gas with pressure regulator.
c. 120/1 with cord and plug, each section/unit.
d. Gas manifold kit.
e. Stainless steel front, top, sides and legs.
f. Stainless steel rear enclosure, each section/unit.
g. Non marking grease resistant casters two with brakes.
h. Safe-T-Link HG-4D3/4”-48-SKPS*M126 gas hose kit with quick disconnect, double swivel ends and posi-set caster positioning system. Seal posi-set sealed with silicone and secure to floor with four non corrosive anchors. Secure restraining device to the building wall and equipment. Coordinate hose size with equipment.
i. Safety set or equal caster positioning system for both rear casters secure to floor with four non corrosive anchors.
j. Installation and assembly per the manufactures instructions and details.
k. Onsite supervision and coordination for all of the utility connections.
l. Start up, testing and calibration by factory authorized service agency.
m. Onsite demonstration by factory representative.
n. One year onsite parts, service and labor warranty.

V. Item 22 – Heater/ proofer cabinet – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.

W. Item 23 – Bun pan rack – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.

X. Item 24 – Work table – one required
1. Fabricated according to details, drawings and specifications, 36” high to top.
2. Provide the following:
a. 14 gauge stainless steel top.
b. All free sides turned down 1 ½” and back ½” on a slight angle.
c. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½” and back ½” on a slight angle and turn up 2” at walls.
d. Copper flashed weld studs capped with stainless steel acorn nuts.
e. ¾” tacky tape between all metal surfaces.
f. Two 14 gauge stainless steel hat channels full length, fully welded to end channels.
g. 1 5/8” 16 gauge stainless steel tubing legs.
h. Stainless steel gussets fully welded to channels.
i. Four all swivel polyurethane casters, 300 pound load capacity each, two with brakes.

j. Channels shall be welded to each other with a 1” x 4” x 1” continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
k. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
l. One year onsite parts, service and labor warranty.

Y. Item 25 – Refrigerator – one required
1. Traulsen RHT232WPUT-FHS*M126.
2. Provide the following:
a. 120/1 with cord and plug.
b. All four doors glass.
c. Pass thru unit.
d. Right door hinged right and left door hinged left, both sides.
e. Two doors with four (eight total) epoxy coated wire shelves with mounting hardware.
f. Non marking grease resistant casters two with brakes.
g. Installation and assembly per the manufactures instructions and details.
h. Onsite supervision and coordination for all of the utility connections.
i. Start up, testing and calibration by factory authorized service agency.
j. Onsite demonstration by factory representative.
k. Five year compressor warranty.

Z. Item 26 – Heated cabinet – four required
1. Winholt INHPL-1836C*M126.
2. Provide the following:
a. 120/1, each unit.
b. Cord and plug, each unit.
c. 1440 watts to plug into any standard outlet, each unit.
d. Standard door hinging, each unit.
e. Non marking grease resistant casters two with brakes, each unit.
f. Installation and assembly per the manufactures instructions and details.
g. Onsite supervision and coordination for all of the utility connections.
h. Start up, testing and calibration by factory authorized service agency.
i. Onsite demonstration by factory representative.
j. One year onsite parts, service and labor warranty.

AA. Item 27 – Hydro vection steamer oven – one required
1. Top section.
2. Blodgett DFG-100*M126.
3. Provide the following:
a. Natural gas with pressure regulator.
b. 120/1 with cord and plug, each section/unit.
c. Gas manifold kit.
d. Stainless steel front, top, sides and legs.
e. Stainless steel rear enclosure, each section/unit.
f. Non marking grease resistant casters two with brakes.
g. Safe-T-Link HG-4D3/4”-48-SKPS*M126 gas hose kit with quick disconnect, double swivel ends and posi-set caster positioning system. Seal posi-set sealed with silicone and secure to floor with four non corrosive anchors. Secure restraining device to the building wall and equipment. Coordinate hose size with equipment.
4. Bottom section.
5. Blodgett HVH-100G*M126.
6. Provide the following:
a. Natural gas with pressure regulator.
b. 120/1 with cord and plug, each section/unit.
c. Water pressure regulator.

d. Backflow preventer.
e. Safe-T-Link HG-4D3/4”-48-SKPS*M126 gas hose kit with quick disconnect, double swivel ends and posi-set caster positioning system. Seal posi-set sealed with silicone and secure to floor with four non corrosive anchors. Secure restraining device to the building wall and equipment. Coordinate hose size with equipment.
f. Two complete 3/4” x 60” long T & S flexible water hose kit with quick disconnect and double swivel ends.
g. Non marking grease resistant casters two with brakes.
h. Safety set caster positioning system for both rear casters seal and secure to floor with four non corrosive anchors.
i. Cuno SF165 water filter system, mounted where shown.
j. Two Pass and Seymour 2095 outlets to electrician for installation.
k. Installation and assembly per the manufactures instructions and details.
l. Onsite supervision and coordination for all of the utility connections.
m. Start up, testing and calibration by factory authorized service agency.
n. Onsite demonstration by factory representative.
o. One year onsite parts, service and labor warranty.

AB. Item 28 – Range – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.
2. Provide the following:
3. Natural gas with pressure regulator.
4. Four non marking grease resistant casters two on front with brakes.
5. Safe-T-Link HG-4D3/4”-48-SKPS*M126 gas hose kit with quick disconnect, double swivel ends and posi-set caster positioning system. Seal posi-set sealed with silicone and secure to floor with four non corrosive anchors. Secure restraining device to the building wall and equipment. Coordinate hose size with equipment.
6. Safety set or equal caster positioning system for both rear casters secure to floor with four non corrosive anchors.
7. Installation and assembly per the manufactures instructions and details.
8. One year onsite parts, service and labor warranty.

AC. Item 29 – Braising pan – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.
a. Provide the following:
b. Natural gas with pressure regulator.
c. 120/1 with cord and plug.
d. T & S B-0300-WD-CR hot and cold water faucet MODIFIED with ceramic cartridges with spring check valves, 60” flexible stainless steel hose, B-0107 spray valve and 004R finger hook. 14 gauge stainless steel fabricated faucet bracket mounted where shown.
e. 14 gauge stainless steel fabricated faucet bracket mounted where shown.
f. Secure rear flanged feet to floor with non corrosive anchors, if required.
g. Safe-T-Link HG-4D3/4”-48-SKPS*M126 gas hose kit with quick disconnect, double swivel ends and posi-set caster positioning system. Seal posi-set sealed with silicone and secure to floor with four non corrosive anchors. Secure restraining device to the building wall and equipment. Coordinate hose size with equipment.
h. Installation and assembly per the manufactures instructions and details.
i. Onsite supervision and coordination for all of the utility connections.
j. Start up, testing and calibration by factory authorized service agency.
k. Onsite demonstration by factory representative.
l. One year onsite parts, service and labor warranty.

AD. Item 30 – Work table – one required

1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.

AE. Item 31 – Preparation table – one required
1. Fabricated according to details, drawings and specifications.
2. Provide the following:
   a. 14 gauge stainless steel one piece coved corner top.
   b. Marine edge where shown 33 ½" to top.
   c. 34" high to top of marine edge. Front/ends turned down 1 ½" and back ½" on a slight angle.
   d. 8" high splash at walls from top of marine edge.
   e. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls.
   f. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
   g. Copper flashed weld studs capped with stainless steel acorn nuts.
   h. ¾" tacky tape between all metal surfaces.
   i. Stainless steel gussets fully welded 360 degrees to channels.
   j. 1 5/8" 16 gauge stainless steel tubing legs.
   k. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
   l. Stainless steel adjustable bullet feet.
   m. Stainless steel flanged feet at two front corners with two holes, secure to floor with two non corrosive anchors.
   n. Component Hardware S90-0020-N*M126 20" drawer assembly with 18 gauge stainless steel bottom enclosure plate and 18 gauge stainless steel top enclosure plate, secured to channels on four sided 14 gauge stainless steel fully welded frame studded to channels or top. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
   o. Two 20" X 24" X 10" deep 14 gauge stainless steel coved corner sinks.
   p. One T & S MPZ-8WLN-08-CR mini pre rinse faucet with ceramic cartridges, 8" add on spout with pre rinse riser support bracket secured to wall with stainless steel screws.
   q. Two Fisher 22411*M126 lever handle drains with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8" maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
   r. 16 gauge stainless steel removable overshelf, mounted on 1 5/8" outside diameter tubing supports through splash to sockets welded to channels and back splash. 14 gauge stainless steel brackets, 14 gauge stainless steel channels fully welded to brackets. 2" X 3/16" stainless steel band fully weld to brackets full length. Stainless steel pot hooks 8" on centers. Mounted 60" above finished floor, verify height with mini pre rinse faucet and owner. Free sides turned down 1 ½" and back ½" on a slight angle and at all walls turn up 2.
   s. Channels shall be welded to each other with a 1" x 4" x 1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
   t. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
   u. One year onsite parts, service and labor warranty.

AF. Item 32 – Cook's table – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.

AG. Item 33 – 20 quart mixer – one required

1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.
2. Provide the following:
   a. Cord and plug.
   b. Piper 121-23-29TSS*M126 stand or fabricated equal with MX-52-R utensil rack and four 5” diameter polyurethane casters, two with brakes.
   c. Installation and assembly per the manufactures instructions and details.
   d. Onsite supervision and coordination for all of the utility connections.
   e. Installation and assembly per the manufactures instructions and details.
   f. One year onsite parts, service and labor warranty.

AH. Item 34 – Slicer – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plans.
2. Provide the following:
   a. Cord and plug.
   b. New age 98000 stand with polyurethane casters, two C450*M126 and two C455*M126 with brakes.
   c. Installation and assembly per the manufactures instructions and details.
   d. Onsite supervision and coordination for all of the utility connections.
   e. Installation and assembly per the manufactures instructions and details.
   f. One year onsite parts, service and labor warranty.

AI. Item 35 – Cashier’s counter – two required
1. Duke TCS-30SS*M126.
2. Provide the following:
   a. 14 gauge stainless steel top, each unit.
   b. 34” high to top, each unit.
   c. Stainless steel base front, rear and both ends, each unit.
   d. Plastic laminated on base front and ends with non-standard color and pattern to be selected by Architect and Owner, each unit.
   e. Stainless steel drawer with cylinder lock and keys, each unit.
   f. Four polyurethane casters two with brakes, each unit.
   g. Stainless steel solid tray slide mounted on stainless steel fold down brackets.
   h. Opening in top with plastic grommet for cash register cord and plug, each unit.
   i. Duplex outlet in base with cord and plug, each unit.
   j. Installation and assembly per the manufactures instructions and details.
   k. Onsite supervision and coordination for all of the utility connections.
   l. Start up, testing and calibration by factory authorized service agency.
   m. Onsite demonstration by factory representative.
   n. One year onsite parts, service and labor warranty, each unit.

AJ. Item 36 – Floor trough – one required
1. Fabricated according to details, drawings and specifications.
2. Provide the following:
   a. 14 gauge stainless steel coved corner pan per detail with anti splash.
   b. CHG D34-Y011 drain assembly with removable basket drain fully welded to bottom.
   c. 1’-6” x 2’-0” inside.
   d. 1” x 3/16” stainless steel bar grate with four sided perimeter frame per detail in removable sections 18” long each max. Number grate section for each trough 1-1, 1-2, 1-3 / 2-1,2-2, 2-3.
   e. Installation and assembly per the manufactures instructions and details.
   f. Onsite supervision and coordination for all of the utility connections.
   g. One year onsite parts, service and labor warranty.

AK. Item 37 – Table with sink – one required
1. Fabricated according to details, drawings and specifications, 34” high to top.

2. Provide the following:
   a. 14 gauge stainless steel one piece coved corner top.
   b. Top turned down 1½" and back ½" on a slight angle on all free sides.
   c. 8" high splash at walls.
   d. 18 gauge stainless steel undershelf where space allows notched and fully welded to legs. Free sides turned down 1 ½" and back ½" on a slight angle and turn up 2" at walls.
   e. Two 14 gauge stainless steel hat channels full length, fully welded to end channels. DO NOT OMIT OR NOTCH CHANNELS FOR DRAWER FRAME.
   f. Copper flashed weld studs capped with stainless steel acorn nuts.
   g. ¾" tacky tape between all metal surfaces.
   h. Stainless steel gussets fully welded 360 degrees to channels.
   i. 1 5/8" 16 gauge stainless steel tubing legs.
   j. 1 5/8" 16 gauge stainless steel tubing crossrails fully welded 360 degrees to legs.
   k. Stainless steel adjustable bullet feet.
   l. Stainless steel flanged feet at front outside corners with two holes, secure to floor with two non corrosive anchors.
   m. 20" X 24" X 10" deep 14 gauge stainless steel coved corner sink.
   n. T & S B-231-CR*M126 faucet with ceramic cartridges.
   o. Fisher 22411*M126 lever handle drain with 14 gauge stainless steel handle bracket secure to sink bottom with weld studs and stainless steel acorn nuts, hole in bracket 1/8" maximum larger (LARGE HOLE OR ELONGATED SLOT IS NOT ALLOWED) than handle diameter. MODIFIED drain handle length (reduce or extend) to make the drain handle flush with the face of the sink bowl.
   p. 16 gauge stainless steel removable overshelf, mounted on 1 5/8" outside diameter tubing supports through splash to sockets welded to channels and back splash. 14 gauge stainless steel brackets, 14 gauge stainless steel channels fully welded to brackets. 2" X 3/16" stainless steel band fully weld to brackets full length. Stainless steel pot hooks 8" on centers. Mounted 60" above finished floor, verify height with owner. Free sides turned down 1 ½" and back ½" on a slight angle and at all walls turn up 2.
   q. Channels shall be welded to each other with a 1" x 4" x 1" continuous weld, typical. Gussets shall be welded to channels or plate with a 360 degrees continuous weld, typical.
   r. All welding and stainless steel surfaces grind smooth and polished to a number 4 finish.
   s. One year onsite parts, service and labor warranty.

AL. Item 38 – Hood – one required
1. Captive Aire ND-2-PSP-F*M126.
2. Provide the following:
   a. Ventilator to be U.L. Listed, N.S.F. approved with a stand off type in accordance with NFPA Pamphlet No. 96.
   b. Ventilator to be constructed, 17'-0" long X 5'-0" wide X 2'-0" high, as per the drawing. Ventilators to be complete with removable captrate solo stainless steel baffle type filters. All electrical shall be pre-wired to one final connection point. With electrical control panel.
   c. NOTE: Mechanical/Electrical Contractors to connect field joint connections, as required.
   d. Construct entire unit of a minimum 18 gauge, type 304 stainless steel with a #4 mill finish. All external seams and joints to be welded and liquid tight; grind and polish all exposed welds. Provide stainless steel closure panels, bottom and sides, between the two Ventilators.
   e. Zero inch to combustibles construction on top, front rear and both sides.
   f. Ventilator to have ten U.L. Listed light fixtures (pre-wired) with stainless steel trim and 18 year LED light bulbs.

g. Each Ventilator section to incorporate a PSP-F make-up system.
h. Each Ventilator section to be provided with appropriate number of concealed, ½" diameter threaded hanger rods to support the Ventilator from the building structure.
i. Ventilator to be furnished with Ansul R-102 Wet Chemical Fire Protection System for protection of Ventilator, exhaust ducts and the Cooking Equipment against grease fire by a pressurized, U.L. Listed, automatic fire extinguishing system in stainless cabinet. All exposed piping chrome plated with chrome fittings.
j. All exposed piping shall be chrome plated with chrome fittings. Items not chromed are corning boxes, pulleys, conduit and fusible link brackets. Wherever possible, all piping shall be concealed behind closure panels and ceiling. System shall be provided with One-Year Service Contract.
k. System to be furnished with one remote manual release.
l. Gas shut-off valve, verify size, furnished with system and installed by Mechanical Contractor.
m. System shall be installed and field tested according to Manufacturer's Instructions and the Insurance Office of State Specifications.
n. Provide Electrical Control Panel, mounted to Ventilator, where shown on drawing, for lights, exhaust/make-up air fans and Fire Control System, per electrical drawings.
o. Energy management system.
p. All exhaust fans, air-handling units, ductwork, electrical hook-ups and electrical disconnects are to be furnished and installed by respective Contractors. All exhaust ductwork to be installed and fully welded, vacuum tight per NFPA #96 pamphlet by respective Contractors.
q. Electrical Contractor to furnish and install all material and field wire to lights, fan "On-Off" switch, Shunt Trip Breaker and motor controllers.
r. 18 gauge 304 stainless steel, removable enclosures panels to finished ceiling, DO NOT WELD TO HOOD, enclosure panels shall be obtained from Captive aire as part of the hood no exceptions. Verify ceiling height.
s. Enclosure panel mounting channel on top of hood at all free sides.
t. Balancing of complete hood system, by Kitchen Equipment contractor, for optimum operation per SMACNA instructions by a certified technician including all data per SMACNA TAB forms. Submit two copies of the data to the Architect, Consultant and Owner.
u. 18 gauge 304 stainless steel wall panels set on top of wall base to underside of hood where panel extends beyond hood extend to finished ceiling, to extend 18" past hood (from floor to to finished ceiling) on each side, verify length with drawings. Keep number of symmetrical vertical 1" Z type shaped overlap seams to a minimum. Silicone all seams and edges water tight. Cut holes for all outlets. Furnish and install stainless steel outlet covers for all electrical outlets where panels are installed. Furnish and install stainless steel trim around pipes. Trim free edges and corners with Component Hardware stainless steel cap trim. Cut all openings in panels as required by field conditions and de burr all sharp edges. Attach to wall with a heat resistant adhesive applied to wall and back of paneling with a roller brush allow adhesive to set per manufactures instructions and then apply paneling to wall, silicone or liquid nail may not be used as an adhesive.
v. Installation and assembly per the manufactures instructions and details.
w. Onsite supervision and coordination for all of the utility connections.
x. Start up, testing and calibration by factory authorized service agency.
y. Onsite demonstration by factory representative.
z. One year onsite parts, service and labor warranty.

AM. Item 39 – Fire control system – one required
1. See hood.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

AN. Item 40 – Hood fans – one required
1. Provided and installed by the mechanical contractor.

2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

AO. Item 41 – Hand sink – three required
1. Provided and installed by the mechanical contractor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

AP. Item 42 – Chip rack – two required
1. Provided and installed by vendor.
2. Kitchen Equipment Contractor shall coordinate installation with kitchen equipment.

AQ. Item 43 – Flat top counter – one required
1. Duke TST-88DSS*M126.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
   a. 14 gauge stainless steel top.
   b. 32” deep top and 34” high to counter top.
   c. Stainless solid steel tray slide mounted on stainless steel fold down brackets.
   d. Stainless steel base front, rear and both ends.
   e. Plastic laminated on base front with non-standard color and pattern to be selected by Architect and Owner.
   f. Omit intermediate under shelf.
   g. Stainless steel legs and feet*M126.
   h. 120-208/1 receptacle mounted below the top (set bracket back 6” from counter edge) on a 14 gauge stainless bracket for heated merchandiser item 44 pre wired to junction box below undershelf.
   i. Installation and assembly per the manufactures instructions and details.
   j. Onsite supervision and coordination for all of the utility connections.
   k. Start up, testing and calibration by factory authorized service agency.
   l. Onsite demonstration by factory representative.
   m. One year on site parts, service and labor warranty.

AR. Item 44 – Heated merchandiser, sloped – one required
1. Hatco GR2SDS-48D*M126.
2. Provide the following:
   a. 120-208/1 with cord and plug.
   b. Special electrical cord length, if required, to reach outlet.
   c. Designer colors for corner caps, unit and inset panel as selected by the Architect and Owner.
   d. Installation and assembly per the manufactures instructions and details.
   e. Onsite supervision and coordination for all of the utility connections.
   f. Start up, testing and calibration by factory authorized service agency.
   g. Onsite demonstration by factory representative.
   h. One year onsite parts, service and labor warranty.

AS. Item 45 – Sandwich unit – one required
1. True TSSU-60-16-ADA*M126.
2. Provide the following:
   a. 120/1 with cord and plug.
   b. 34” high to top.
   c. Heavy duty 16 gauge stainless steel top.
   d. True 920391 sneeze guard mounted to rear of unit with tubing supports and hardware.
   e. Polyurethane casters two with brakes.
   f. Installation and assembly per the manufactures instructions and details.
   g. Onsite supervision and coordination for all of the utility connections.
   h. Start up, calibration and demonstration by factory authorized service agency.
   i. One year onsite parts, service and labor warranty.
   j. Five year compressor warranty.

AT. Item 46 – Pizza oven counter – two required
1. Duke TST-60DSS*M126.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
   a. 14 gauge stainless steel top.
   b. Top seamless.
   c. 32” deep top and 34” high to counter top.
   d. Stainless steel base front, rear and both ends.
   e. Plastic laminated on base front with non-standard color and pattern to be selected by Architect and Owner.
   f. Omit intermediate under shelf.
   g. Stainless steel legs and feet*M126.
   h. Installation and assembly per the manufactures instructions and details.
   i. Onsite supervision and coordination for all of the utility connections.
   j. Start up, testing and calibration by factory authorized service agency.
   k. Onsite demonstration by factory representative.
   l. One year on site parts, service and labor warranty.

AU. Item 47 – Pizza oven – one required
1. Lincoln V2501*M126.
2. Provide the following:
   a. 208/1.
   b. Cord and plug.
   c. Vent free.
   d. Factory agent start up testing and heat fingers balancing.
   e. Installation and assembly per the manufactures instructions and details.
   f. Onsite supervision and coordination for all of the utility connections.
   g. Start up, testing and calibration by factory authorized service agency.
   h. Onsite demonstration by factory representative.
   i. One year onsite parts, service and labor warranty.

AV. Item 48 – Pizza serving counter – one required
1. Duke TST-60DSS*M126.
2. Fabricated according to details, drawings and specifications.
3. Provide the following:
   a. 14 gauge stainless steel top.
   b. 32” deep top and 34” high to counter top.
   c. Stainless steel base front, rear and both ends.
   d. Plastic laminated on base front with non-standard color and pattern to be selected by Architect and Owner.
   e. Omit intermediate under shelf.
   f. Stainless steel legs and feet*M126.
   g. TS540*M126 series guard full length with 18 gauge stainless steel top and ends, full length fluorescent lights.
   h. Three 120/1 receptacles mounted below the top (set bracket back 6” from counter edge) on three 14 gauge stainless bracket for pizza warmer item 49 pre wired to junction box below undershelf.
   i. Installation and assembly per the manufactures instructions and details.
   j. Onsite supervision and coordination for all of the utility connections.
   k. Start up, testing and calibration by factory authorized service agency.
   l. Onsite demonstration by factory representative.
   m. One year on site parts, service and labor warranty.

AW. Item 49 – Pizza warmer, round – three required
1. Hatco GRSSR-18*M126.
2. Provide the following:

a. 120/1 with cord and plug.
b. Special electrical cord length each unit, if required, to reach outlets.
c. Installation and assembly per the manufactures instructions and details.
d. Onsite supervision and coordination for all of the utility connections.
e. Start up, testing and calibration by factory authorized service agency.
f. Onsite demonstration by factory representative.
g. One year onsite parts, service and labor warranty.

AX. Item 50 – Refrigerator – one required
1. Existing kitchen equipment contractor to remove, transport to and from project or storage site, store, thoroughly clean and relocate to the location shown on the kitchen plan

2.05 ITEMIZED PRICES

A. Bidders that do not provide itemized prices for all specified Kitchen Equipment will be rejected.

B. List prices for alternates to specified items on a separate sheet with specifications.

C. Itemized prices may be submitted in Auto Quotes format or spread sheet.
1. Equipment Sub total (equipment only no labor) _____
2. State Taxes (equipment only no labor) _____
3. Local/County Taxes _____
4. Bond (when required) _____
5. Installation Labor _____
6. Total Bid Price _____$_____

PART 3 – EXECUTION

3.01 INSTALLATION OF KITCHEN EQUIPMENT

A. Unload, uncrate, assemble, set-in place, hang, level and adjust Kitchen Equipment. Tag parts shipped loose. Furnish necessary installation instructions. Clean up all trash immediately upon completion of installation and remove from the project site.

B. Neatly seal gaps of ¼" or less between Kitchen Equipment and walls, other equipment and floors with a "50 year" high quality food grade clear silicone sealant. Seal gaps of ¼" or more with 14 gauge stainless steel trim fully welded ground smooth and polished to No. 4 finish or neatly attach trim with concealed stainless steel blots and nuts silicon trim to wall.

C. Erect Kitchen Equipment at project site in full compliance with the codes and regulations of the state and local Health Department.

D. Remove all protective coatings and other markings from Kitchen Equipment before demonstration. Wash with soap and water, rinse clean and dry spotless.

E. Provide a competent foreman at the project site to supervise installation of all Kitchen Equipment, and to coordinate with other trades in reference to connections at time of installation. Tag and deliver plumbing and electrical parts, furnished loose and specified as part of the Kitchen Equipment to respective installing trades.

F. Provide all Zee clips and angles necessary for wall mounting of Kitchen Equipment.

G. Any sleeves, flanges of anchor bolts required to be built in to building structure to be provided to respective trades.

3.02 TESTING, CALIBRATION AND DEMONSTRATION

A. After completion of final connection by respective trades, test and calibrate Kitchen Equipment for proper operation. Make any necessary adjustments and re-test, repair or replace Kitchen Equipment producing objectionable noise.

B. Repair finishes marred during handling and installation or replace if required by the owner or consultant.

C. Schedule demonstration of Kitchen Equipment with manufacturer's representatives, and owner's personnel.

D. Provide pictures of completed punch list deficiencies to Contractor, Architect Owner and Consultant for review after all punch list work has been completed.

END OF SECTION

SECTION 11 53 00
LABORATORY EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Laboratory equipment.

B. Connection to utilities.

C. Service fittings and outlets.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide equipment dimensions and construction, equipment capacities, physical dimensions, utility and service requirements and locations, point loads .

C. Shop Drawings: Indicate equipment locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required.

D. Samples: Submit two samples of exposed finish surfaces, 12 inch in size illustrating color and finish.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate special installation requirements.

G. Operation Data: Include description of equipment operation and required adjusting and testing .

H. Maintenance Data: Identify system maintenance requirements, servicing cycles, lubrication types required and local spare part sources.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for Fume Hood equipment.

B. Conform to UL requirements for fabrication and installation of fume hood equipment.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Laboratory Equipment:
   1. Basis of Design: Air Foil Fume Hood, Eliminator Series, as manufactured by Air Master Systems; www.airmastersystems.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS FOR STANDARD FUME HOOD

A. Basis of Design: FH - Model 100 (EH-111-60) Eliminator Airfoil Fume Hood by Air Master Systems.

B. Installation Accessories: Provide all rough-in frames, anchors, supports, accessories and closure trim required for complete installation.

C. Fluorescent light fixture with bulbs accessed from outside the air chamber.

D. Black powder coated airfoil and sash. Outer wall chemically resistant powder coated sheet steel with a phenolic sheet inner lining. Double wall 5 inch chase for plumbing and electrical fixtures within walls.

E. Louvered front panel.

F. Size: 60 inch Hood.

G. CFM at 100LFM: 770.

H. Exhaust Size: 10 inches diameter.

I. Front opening of airfoil framed with a 45 degree angle fascia to reduce turfulence of air entering the hood. Bottom horizontal airfoil to direct a current of air at countertop level to purge heavy fumes or spillage.

J. 2 cup sinks.

K. AFA 500 Alarm.

L. Electrical Characteristics: 120VAC, 20A, 60Hz.

2.03 COMPONENTS FOR ADA FUME HOOD

A. Basis of Design: FH-ADA Model 500 (EH-511-60) Eliminator Airfoil Fume Hood by Air Master Systems.

B. Installation Accessories: Provide all rough-in frames, anchors, supports, accessories and closure trim required for complete installation.

C. Fluorescent light fixture with bulbs accessed from outside the air chamber.

D. Black powder coated airfoil and sash. Outer wall chemically resistant powder coated sheet steel with a phenolic sheet inner lining. Double wall 5 inch chase for plumbing and electrical fixtures within walls.

E. Louvered front panel.

F. Size: 60 inch Hood.

G. Exhaust Size: 10 inches diameter.

H. Front opening of airfoil framed with a 45 degree angle fascia to reduce turfulence of air entering the hood. Bottom horizontal airfoil to direct a current of air at countertop level to purge heavy fumes or spillage.

I. 2 cup sinks.

J. AFA 500 Alarm.

K. Electrical Characteristics: 120VAC, 20A, 60Hz.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough-in frames, anchors and supports are accurately placed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with standards required by authority having jurisdiction.

C. Anchor equipment securely in place.

D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

E. Touch-up minor damaged surfaces caused during installation. Replace damaged components as directed by Architect Engineer.

3.03 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.04 CLOSEOUT ACTIVITIES

A. Demonstrate equipment operation.

END OF SECTION

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SECTION 11 61 43
STAGE CURTAINS AND TRACKS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Intent: This specification requires the fabrication, furnishing, delivery, and installation of the stage rigging system, track, curtain, and all incidental or related items necessary to complete the Work as described herein, even though they may not be specifically enumerated.

B. Work Included: The work of this section shall include, but not necessarily be limited to the following:
   1. Furnish and install dead hanging pipe battens as described herein and shown on the project drawings.
   2. Furnish and install complete set, stage curtains and track as outlined herein and shown on project drawings.
   3. Provide training for end user designated personnel. Training will include demonstrating proper operation of all material described herein.

1.03 RELATED SECTIONS

A. Structural steel and miscellaneous metals not specifically called out as part of this section.

1.04 FIELD CONDITIONS

A. All Bidders shall fully inform themselves of the conditions under which the work is to be performed. No additional compensation shall be allowed for any labor or item Bidder could have been fully informed of prior to the bid date.

B. Field measurements must be taken prior to fabrication and shall be submitted for approval.

1.05 GENERAL REQUIREMENTS:

A. Variation: While the components, units, and arrangements described herein and shown on the drawings indicate specific details for the realization of the stage systems, bidders may propose alternate details and components which will fulfill the functional parameters of the envisioned system. In such event, bidders shall submit a complete set of specifications and drawings, not less detailed than these and following the same general outline, together with a detailed statement indicating paragraph by paragraph wherein the equipment to be offered deviates from specifications included in this bid request. Where alternate proposals are offered they shall be submitted with the amount to be added or deducted from the base bid which is required from all bidders.

B. Extent: The supplier shall provide all items, articles, materials, and operations listed, mentioned or scheduled in the drawings, and herein specified, including all tools, scaffolding, labor, supervision, and incidentals necessary and required for their completion. Any errors, omissions or ambiguities are not to condition this requirement, but shall be brought to the attention of the Architect Engineer for their possible effect on the intent of the specifications.

C. Safety: The systems shall conform to all applicable code requirements and shall be in conformance with applicable industry and ANSI Standards. All materials, arrangements, and procedures shall comply with applicable code requirements, allowing the users to arrange and operate a safe assembly and working environment for audience and user personnel.

D. Insurance: In the absence of more stringent requirements, the Rigging Supplier shall maintain injury and property liability insurance coverage throughout the project's scheduled timetable, including workmen's compensation coverage for Supplier's employees. At no time throughout this project will the Owner be liable for any damage, loss or personal injury claims arising out of the negligence of the Rigging Supplier.

1.06 SUBMITTALS

A. Drawings: Submit shop and installation drawings and schedules showing all information necessary to explain fully the design features, appearance, function, fabrication, installation, and use of system components in all phases of operation. They shall be approved by the Architect Engineer before fabrication, installation, or erection have begun. Such approval does not relieve the Rigging Supplier of the responsibility of providing equipment in accordance with the specifications. Any deviations from the specifications shall be “starred” and noted in 1/4 inch high letters. Only deviations which upgrade the quality of the equipment or respond to field conditions will be considered.

B. Schedule: Prior to the commencement of the installation work, the Rigging Supplier shall submit an outline of a proposed schedule and requirements for approval.

C. Samples: The Rigging Supplier shall submit samples without causing delay in work, as required by the Owner’s representative and as listed, but not necessarily limited to those specified below.
   1. Large samples and color cards of all fabrics shall be submitted for approval and for color selection. These samples shall be properly tagged as to grade, weight, color, manufacturer and use.

D. Catalog Cuts: In lieu of drawings, the Supplier may wish to submit catalog cuts for certain standard equipment items. These must contain full information on dimensions, construction, applications, etc. to permit proper evaluation. In addition, they must be properly identified as to their intended use. Any options or variations must be clearly noted.

E. Instructions: Upon completion of the work, the Rigging Supplier shall submit 3 copies of a detailed Operating and Maintenance Manual including as-built shop drawings, equipment descriptions, and parts lists. The Rigging Supplier shall go through the manual with Owner-designated personnel to demonstrate and explain the maintenance and operation of the systems.

F. Guarantee: The Rigging Supplier shall provide a one year written guarantee against defects in materials or labor starting from the date of acceptance of equipment by the Owner’s representative. The guarantee shall not include normal wear and tear, damage due to neglect, or improper use of equipment. Any required maintenance or replacement shall be provided by the Rigging Supplier within thirty days of notification by the Owner except for safety related items which shall be corrected within 48 hours of notification. Subsequent to the expiration of the guarantee period the Rigging Supplier agrees to furnish repair and maintenance service, at the Owner’s expense, within thirty days of request for such service.

G. Certificates: A Certificate of Flame Retardancy must be furnished for each fabric used in construction of curtains.

1.07 DELIVERY, STORAGE AND HANDLING

A. The Rigging Supplier shall be responsible for storage of stage equipment, tools, and equipment during the period of the installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. APPROVED EQUIPMENT
   1. Pipe Battens and Rigging Hardware
      a. BellaTex, Inc., Jackson, Tennessee
      b. The Light Source, Inc., Charlotte, North Carolina
   2. Curtain Tracks
      a. H & H Specialties, Inc., South El Monte, California
   3. Stage Curtain Fabrics
      a. BellaTex, Inc., Jackson, Tennessee
      b. K.M. Fabrics, Inc., Greenville, South Carolina

B. STAGE CURTAINS

1. Description and Sizes: Curtains shall be as fabricated by Supplier in accordance with the field verified dimentions. Supplier must field verify all sizes prior to fabrication.
   Borders 3 56'0" 5'0" 0 B Dead hanging pipe
2. Fabric types:
   a. 26 ounce Charisma, Inherently Fire Resistant (IFR) Synthetic Woven Velour. Standard color as selected by Architect Engineer.
3. Flame Retardancy: Cotton fabrics and other flammable fabrics must be chemically mill treated for flame retardancy according to the requirements of the National Fire Protection Association's NFPA #701.
4. Fullness: See above for fullness of each curtain.
   a. 0% = flat, no extra material.
   b. 50% - 100% = additional fabric to be included, exclusive of turnbacks and hems.
5. Seams: Seams between strips shall be single stitched without puckers using thread of matching color. All fabrics with a grain or pile shall have all strips running in the same direction.
6. Pleats: Pleats shall be box type on 12" centers. All curtains are to have their pleats arranged to conceal the seams.
7. Top Finish: 3-1/2" jute webbing (or heavy weight Poly Pro Webbing for curtains constructed from synthetic fabrics) shall be double stitched to the top of the curtain with 1" of face fabric turned under the webbing. Brass rustproof grommets - color black - shall be inserted in pleat centers.
   a. Grommets shall be used as follows:
      1) #2 grommets - muslin, light weight fabrics.
      2) #3 grommets - unlined velour, medium weight fabrics.
      3) #4 grommets - lined velour, heavy weight fabrics.
   b. Track-mounted curtains shall be supplied with CCF-2 curtain to carrier snap hooks. Harness snap hooks sewn to webbing in lieu of grommet & CCF-2 arrangement will be acceptable. S-hooks are not acceptable. Batten mounted curtains are to be supplied with 36" braided #4 cotton tie lines. Tie lines shall be black or white to best match the curtains with the center line in alternate color to aid in hanging curtains.
8. Bottom Hems:
   a. Valances shall have 4" bottom hems.
   b. Full height curtain shall have 6" bottom hem complete with separate interior chain pockets filled with #8 plated jack chain. Chain pockets shall be stitched so that the chain will ride 2" above the finished bottom edge of the curtain.
   c. Scrims, drops and cycloramas shall have an additional pipe pocket sewn to the back of the hem and shall be furnished with a 3/4" pipe batten, threaded and coupled every 10 feet.
9. Side Hems:
   a. Front Curtain shall have a minimum 24 inch of face fabric turned back at each edge.
   b. All other side hems shall be 3".
10. Lining: Lining, if required in the above listing, shall conform to the following requirements.
    a. Lining shall be in the same fullness as face fabric.
    b. Lining shall finish 2" shorter than face fabric.
    c. Lining shall be attached to the face fabric along the bottom hem at seams by 4" long heavy woven cotton tape.

C. MODEL 428A Curtain Track
1. Track shall be 14 gauge galvanized steel, roll-formed to 2-5/8" wide X 2-3/4" high channel with continuous slot in bottom. Provide unspliced in lengths up to 24'.
2. Suspend track with two-piece clamp hanger formed from 11 gauge steel. Provide 2' overlap at center, rigidly separated by two overlap clamps. Install end stop with cord support at each track end. Where lengths exceed 24', connect tracks with 12" long, two-piece splicing clamp of 12 gauge steel.
3. Provide single carriers, spaced on 12" centers, constructed of two urethane-tired wheels fastened parallel to carrier body. Supply with heavy-duty hook, swivel eye and 6" trim

chain for attachment of curtain. Black Super Tough nylon shall be molded around shielded and greased ball bearing to form carrier body. Install round neoprene bumper between each carrier to reduce noise.

4. Master carriers shall be 4-wheel urethane-tired assemblies with bodies formed from 11 gauge steel with press-fit ball bearings. Connect to operating line with two formed steel cord clamps attached to each body. Supply each master carrier with two heavy-duty hooks, swivel eyes and 6" trim chains for attachment of leading edge of curtain.
5. Single and double end pulleys shall clamp securely to the underside of the track channel and shall be equipped with 6" diameter Nylatron GS sheaves grooved for up to 1/2" operating line. Install two 5/8" sealed precision ball bearings in each sheave. Lock shaft to side plate on head end with 3/16" keeper pin to prevent rotation and install fine-threaded nylon insert lock nut.
6. Provide floor block in 12 gauge steel housing containing 6" Nylatron sheave with two 3/8" sealed precision ball bearings. Sheave axle shall lock at any point within 9" vertical slots to allow tension adjustment of operating line.
7. Black operating line shall be 3/8" diameter, stretch-resistant rope with spun polyester outer jacket braided over solid aramid core.
8. Track shall be finished with a semi-gloss black powder coat. All other steel components shall be black finished.

D. DEAD HANGING PIPE BATTENS (VALANCE)
1. Provide dead hanging pipe battens as indicated on project drawings for support of stage lighting, stage curtain tracks and stage curtains.
2. Battens shall be constructed from lengths of 1.5” nominal I.D. schedule 40 pipe. Pipe to be degreased and cleaned then painted, powder coated or anodized black. All joints shall be sleeve spliced with 18” long sleeves with 9” extending into each pipe and held by two 3/8” hex bolts and lock nuts (grade 5 minimum) on each side of the joint.
3. The pipe shall be rigidly hung from the overhead steel structures on centers not exceeding 10 feet using 3/8” threaded rod ending in captive U-bolt bracket. At each hanging point the threaded rod shall attach to the overhead structure with an appropriate fitting.
   a. An approved alternate method of hanging the batten pipe is by using 1/4” 7x19 galvanized utility cable ending in 6” x 3/8” forged turnbuckles attached to pipe clamps. At each hanging point the chain or cable shall attach to the overhead structure with an appropriate fitting. Cables shall be formed over thimbles of correct size and fastened with two forged cable clips or Nicopress sleeves crimped three times. Turnbuckles shall be moused after final trim.

PART 3 EXECUTION

3.01 INSTALLATION:

A. Extent: All specified equipment shall be installed by fully trained superintendents and workmen who are fully responsible to, and fully represent the stage rigging company. Equipment shall be installed in a workman like manner, in accordance with drawings and specifications. Equipment shall be aligned, adjusted, and trimmed for the most efficient operation, the greatest safety and for the best visual appearance.

B. Standards:
1. Installation practices shall be in accordance with OSHA Safety and Health Standards and all local codes.
2. All welding must be performed in full compliance with the latest edition of the Structural Welding Code (ANSI/AWS D1.1).

C. Alignment: Mule blocks, cable rollers and guides shall be installed, as required, to provide proper alignment, to maintain specified fleet angles, and to prevent contact with other surfaces.

D. Finishes:
1. Any/all welds must be touched up to match disturbed finishes.
2. All finishes which are disturbed during shipping and installation shall be touched up to match the original.

3.02 CLEAN UP

A. The Supplier shall be responsible for clean up, including removal of packing materials etc. and the protection of surfaces or equipment provided by Work of other Sections.

3.03 INSPECTION AND TESTING

A. Inspection: During the installation of equipment the Rigging Supplier shall arrange for access as necessary for inspection of equipment by the Architect Engineer.

B. Special Testing: If specifications, the Architect Engineer's instructions, laws, ordinances, or any public authority require any work to be specially tested or approved, the Rigging Supplier shall give the Architect Engineer timely notice of its readiness for inspection, and of dates of inspections to be made by other authorities.

C. Completion Testing:
   1. Upon completing the installation of all work specified under this section, the Supplier shall so notify the Architect Engineer, who will schedule an inspection. At the time of this inspection, the Rigging Supplier shall furnish sufficient workers to operate all equipment and to perform such adjustments and tests as may be required by the Architect Engineer.
   2. Any equipment which fails to meet with the specifications shall be repaired or replaced with suitable equipment and the inspection shall be rescheduled under the same conditions as previously specified.
   3. At the time of these inspections, no other work shall be performed in the auditorium and stage areas.
   4. All temporary bracing, scaffolding, etc. shall be removed to permit full operation of and access to all equipment.
   5. Final approval will be withheld until all systems have been thoroughly tested and found to be in first class operating condition in every particular.

END OF SECTION

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SECTION 11 66 23
GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Basketball backboards, goals, and support framing.

B. Floor sleeves for net and goal posts.

C. Wall mounted protection pads.

D. Volleyball nets and posts.

1.03 RELATED REQUIREMENTS

A. Section 09 65 66 - Resilient Athletic Flooring: Gymnasium flooring.

B. Section 26 27 17 - Equipment Wiring.

1.04 REFERENCE STANDARDS

A. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Electrically Operated Equipment: Coordinate location and electrical characteristics of service connection.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data showing configuration, sizes, materials, finishes, hardware, and accessories; include:
   1. Electrical characteristics and connection locations.
   2. Fire rating certifications.
   3. Structural steel welder certifications.
   4. Manufacturer's installation instructions.

C. Shop Drawings: For custom fabricated equipment indicate, in large scale detail, construction methods; method of attachment or installation; type and gage of metal, hardware, and fittings; plan front elevation; elevations and dimensions; minimum one cross section; utility requirements as to types, sizes, and locations.

D. Erection Drawings: Detailed dimensional requirements for proper location of equipment.

E. Samples: Submit samples of wall pad coverings in manufacturer's available range of colors.

F. Operating and maintenance data, for each operating equipment item.

G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. NCAA: Work shall comply with NCAA rules.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified with minimum 3 years of experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to project site in manufacturer's original packaging with factory original labels attached.

B. Store products indoors and elevated above floor; prevent warping, twisting, or sagging.

C. Store products in accordance with manufacturer's instructions; protect from extremes of weather, temperature, moisture, and other damage.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. All basketball backstop structures, including clamps, fittings, and tube shall have a minimum warranty of 25 years from date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Gymnasium Equipment:
1. Draper, Inc: www.draperinc.com.
2. Performance Sports Systems: www.perfsports.com.
3. Porter Athletic Equipment Company: www.porterathletic.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GENERAL REQUIREMENTS

A. See drawings for sizes and locations, unless noted otherwise.

B. Where mounting dimensions or sizes are not indicated, comply with NCAA and Owner's requirements.

C. Provide mounting plates, brackets, and anchors of sufficient size and strength to securely attach equipment to building structure; comply with requirements of contract documents.

D. Hardware: Heavy duty steel hardware, as recommended by manufacturer.

E. Electrical Wiring and Components: Comply with NFPA 70; provide UL-listed equipment.

F. Structural Steel Fabrications: Welded in accordance with AWS D1.1/D1.1M, using certified welders.

2.03 BASKETBALL BACKSTOPS

A. Main Court Backstops (2 Required)
1. TYPE:
   a. Basis of Design: Basketball backstop shall be the DRAPER Model [_____], ceiling-suspended, by Draper, Inc. of Spiceland, IN.
   b. Backstop shall be a welded together main frame constructed from steel mechanical tubing to form a rigid tetrahedral "T" design of back-to-back right triangles. The main stem shall be 6" OD 11-ga. steel tubing, the top of the "T" shall be 4" OD 11-ga. steel tubing and the side braces shall be 2-1/4" OD 14-ga. steel tubing. Side braces shall join stem no higher than 4'6" above goal (18" above top of backboard). The main stem shall be long enough to allow plus or minus 6" height adjustment of either fan or rectangular banks. The folding front brace shall be jackknife type, fully adjustable, self-locking in the down position and constructed of 2-1/2" OD 13-ga. (outer) steel tubing and 2-1/4" OD 14-ga. (inner) steel tubing.

c. Bank attached to the 6" OD main stem by heavy-duty bank hangers. Hangers constructed of 1" x 2" 11-ga. steel tubing and formed 1/4" steel plate with slotted holes for lateral adjustment. All banks shall have one upper bank hanger and include a goal brace, which attaches directly to the goal mounting plate and directly to the 6" main stem of the backstop to eliminate any strain on the bank and help prevent glass breakage. This direct mount feature shall conform to NCAA recommendation No. 5-F.
d. Backstop shall be supported from 4" OD 11-ga. steel mechanical tubing anchored to roof structure by means of heavy steel support hangers. Attachment to building structure to be with clamps capable of supporting a minimum of 20,000 Lbs. each. Superstructure shall be designed with a minimum of four attachment clamps to produce a combined minimum attachment point safety factor of 75 to 1 and manufacture must be able to present independent testing data to substantiate safety factor. Superstructure tubes shall be reinforced with bridging and/or bracing when truss centers exceed 10'0".
e. Backstop shall be provided with choice of black or white powder coat finish.

2. BANK:
   a. Basis of Design: Backboard shall be the DRAPER Model 503136 rectangular glass backboard by Draper, Inc. of Spiceland, IN.
   b. Backboard shall be 3'6" x 6'0" to meet all NCAA, NFHSA and professional requirements. Backboard frame of a heavy, brushed aluminum extrusion for maximum durability. Extended frame section of high tensile aluminum (6063-T5). Ends of the frame extrusions mitered and fitted with a flush, plated steel gusset type mounting bracket on all four corners, incorporating keyhole slots for mounting the backboard to the support structure at standard mounting centers.
   c. Goal mounting structure of a heavy, formed steel assembly, secured to the lower horizontal frame member to minimize stress on the glass section. Special steel sleeves at the goal mounting hole locations to secure rear structure to front mounting plate, forming a unitized assembly to minimize shock to the glass. Entire frame including goal-mounting structure fitted with a shock absorbing neoprene material to cushion and protect the glass section.
   d. 1/2" thick, fully tempered glass section with uniform load and impact strength. Official white border and target area is permanently fired into front side of glass section so that it cannot wear away.
   e. Goal mount structure provided with two holes (7/16") and two studs (3/8"-16) to secure backboard and goal to a direct mount "goal brace" feature which relieves all stress and shock on the backboard conforming to the latest NCAA Rules (BR-73, D-5). Goal mounting holes (4) to be standard 5" (horizontal) x 4" (vertical) mounting centers.
   f. Backboard shall be covered by a Lifetime Limited Warranty when installed on a Draper EZ Fold basketball backstop with Goal Brace or Direct Mount Height Adjuster.
3. BACKBOARD SAFETY PADDING:
   a. Basis of Design: Backboard Edge Padding shall be the DRAPER Model 5032XX bolt-on backboard safety padding by Draper, Inc., Spiceland, IN.
   b. Molding process produces a super tough "skin" on the outside of the foam padding for long life. Pre-molded square corners for improved player safety. Molded-in steel track and bolt-on attachment system eliminate frustrating re-gluing or taping. Meets or exceeds all NCAA and High School Federation specifications. NCAA approved gray color. (Also available: Royal Blue, Scarlet, Navy, Columbia Blue, Kelly Green, Gold, Forest Green, Orange, Purple, Black, and Maroon.) 5-year warranty when installed indoors.
4. GOAL:
   a. Basis of Design: Goal shall be the DRAPER Model 503581 tube-tie breakaway goal by Draper, Inc. of Spiceland, IN.
   b. Goal is designed to withstand shock loads due to a player slam dunking and/or hanging on the rim. The rim shall deflect down when a static load of 230 pounds is applied. The rim will return to the playing position once the load is removed. The

function of the breakaway goal shall meet NCAA specifications, which state: "A movable basket ring shall have rebound characteristics identical to those of a non-movable ring." Goal shall be set at factory for proper flex and rebound requirements. This goal features Draper's easy-adjust system, which allows the end-user to adjust the breakaway point from 160 lbs. to 230 lbs to conform to latest NCAA recommendations.

c. Goal features tube-tie net attachment, which consists of a series of small tubes welded below the rim and a 1/8" nylon cord which passes through the tubes, catching the net loops between the tubes. The tube-tie provides superior strength and a smooth attachment system for maximum player safety. Rim shall be fabricated from a 5/8" diameter steel rod formed into an 18" inside diameter ring. Inside of ring shall be positioned 6" from the face of backboard by a heavy-duty mounting plate with mounting holes centered to match 5" x 5" or 5" x 4" backboard mounting holes. Goal will mount on standard glass, fiberglass, and wood banks.

d. Rim shall be rigidly braced by means of die cut steel braces formed and welded to underside of rim for maximum support. Goal shall be powder coated in an official durable orange powder coat. Goal shall be furnished with zinc plated mounting hardware. Goal provided with white nylon Anti-Whip Net. The top half of the anti-whip net is made of durable fibers encased in tough 100% nylon, preventing the net from whipping up on the rim. The lower half is all nylon. Goal to have a five-year limited warranty

2.04 VOLLEYBALL EQUIPMENT

A. Main Court
   1. Floor Plate, Chrome-plated for existing floors (2 required).
      a. Basis of Design: Volleyball Cover Plate shall be DRAPER model 501001 Chrome plated cover plate by Draper, Inc. of Spiceland, IN.
      b. Chrome plated cover plate assembly shall be provided for use in either synthetic or wood floors. Chrome plated cover plate assembly may be used with new or existing floors. Cover shall consist of a steel outer ring with an outside diameter of 5-1/4" and in inside diameter of 4-1/8". Cover shall be equipped with swivel type retaining screw to prevent theft. A special key shall be provided for opening cover. Six #10 x 1-1/2" fl at head wood screws shall be provided to securely mount cover assembly to floor. Plate shall be installed flat to surface with no obstructions.
   2. Floor Sleeve (One per cover plate required).
      a. Basis of Design: Floor Sleeves shall be DRAPER Model 501006 3-1/2" I.D. Floor Sleeve by Draper, Inc. of Spiceland, IN.
      b. Floor sleeve shall be constructed of steel mechanical tubing with an inside diameter of 3-1/2", welded to a 4" x 4" bottom plate. Sleeve shall be 8-1/2" long and designed to be installed with the bottom at 9 ½" below the playing surface.

2.05 WALL PADDING

A. Wall Padding: Foam filling bonded to backing board, wrapped in covering; each panel fabricated in one piece.
   1. Covering: Vinyl-coated polyester fabric, mildew and rot resistant; stapled to back of board.
      a. Color: As selected from manufacturer's standard range.
      b. Texture: Embossed leather-look.
      c. Fabric Weight: 14 oz/sq yd.
   2. Foam: Urethane, soft, 3.5 pcf nominal density.
   3. Foam: Open cell polychloroprene (Neoprene) 5.5 pcf nominal density.
   4. Foam Thickness: 2 inches.
   5. Backing Board: Oriented strand board.
      a. Thickness: 7/16 inch.
   6. Panel Dimensions: 24 inches wide by 72 inches long, including nailing margins.
   7. Nailing Margins: 1 inch wide, covered by fabric covering.
   8. Mounting: Permanent; using screws.

9. Basis of Design Products:
    a. Draper, Inc; EcoVision Wall Pad - Standard: www.draperinc.com.
    b. Substitutions: See Section 01 60 00 - Product Requirements.
10. Scope:
    a. Located at all column projections in gymnasium
    b. Provide 10 feet of wall padding behind basketball goals
    c. Locate at all outside corners in gymnasium

PART 3 EXECUTION

3.01 EXAMINATION

A. Take field measurements to ensure proper fitting of work. If taking field measurements before fabrication will delay work, allow for adjustments within recommended tolerances.

B. Inspect areas and conditions before installation. Notify Architect Engineer in writing of unsatisfactory or detrimental conditions. Do not proceed until conditions have been corrected. Commencing installation constitutes acceptance of work site conditions.

C. Verify that electrical services are correctly located and of the proper characteristics.

D. Coordinate support of basketball backstops with roof structure to ensure proper distribution of loads and adequacy of attachment points.

3.02 INSTALLATION

A. Install in accordance with contract documents and manufacturer's instructions.

B. Coordinate installation of inserts and anchors that must be built in to flooring or subflooring.

C. Install equipment rigid, straight, plumb, and level.

D. Secure all equipment with manufacturer's recommended anchoring devices.

E. Install wall padding securely, with edges tight to wall and without wrinkles in fabric covering.

F. Separate dissimilar metals to prevent electrolytic corrosion.

3.03 ADJUSTING

A. Verify proper placement of equipment.

B. Verify proper placement of equipment anchors and sleeves. Use actual movable equipment to be anchored if available.

C. Adjust operating equipment for proper operation; remove and replace equipment causing noise or vibration. Lubricate equipment if recommended by manufacturer.

3.04 CLEANING

A. Remove masking or protective covering from finished surfaces.

B. Clean equipment in accordance with manufacturer's recommendations.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.03 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.04 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Corded Window Covering Products; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.

C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

D. Samples: Submit two samples, illustrating slat materials and finish, cord type and color.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds:
   1. Hunter Douglas: www.hunterdouglas.com.
   2. Levolor Contract: www.levolorcontract.com.
   3. SWFcontract, a division of Spring Window Fashions, LLC.: www.swfcontract.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Source Limitations: Furnish blinds and associated controls produced by a single manufacturer and obtained from a single supplier.

2.02 BLINDS

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.
   1. Width: 1 inch.
   2. Thickness: 0.006 inch.
   3. Color: As selected by Architect.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   1. Color: Same as slats.

F. Bottom Rail: Pre-finished, formed aluminum with top side shaped to match slat curvature; with end caps.
   1. Color: Same as headrail.

G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.

H. Control Wand: Extruded hollow plastic; hexagonal shape.
   1. Non-removable type.
   2. Length of window opening height less 3 inch.
   3. Color: Clear.

I. Headrail Attachment: Wall brackets.

J. Accessory Hardware: Type recommended by blind manufacturer.

2.03 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance of 1/47 inch.

C. Fabricate blinds to cover window frames completely.

D. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

C. Place intermediate head supports at maximum 36 inch on center.

3.03 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

END OF SECTION

SECTION 12 35 53.19
WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Wood cabinets and cabinet hardware.

B. Countertops.

1.03 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Requirements for sustainably harvested wood.

B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: VOC limitations for adhesives and sealants.

C. Section 07 92 00 - Joint Sealers: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

1.04 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.05 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

D. ASTM C1036 - Standard Specification for Flat Glass; 2011.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

H. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2009.

I. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

J. NFPA 30 - Flammable and Combustible Liquids Code; 2015.

K. SEFA 2.3 - Installation of Scientific Laboratory Furniture and Equipment; 2010.

L. SEFA 3 - Work Surfaces; 2010.

M. SEFA 7 - Laboratory and Hospital Fixtures; 2010.

N. SEFA 8W - Laboratory Grade Wood Casework; 2010.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Service Fixtures: Coordinate location and characteristics of service connections.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

C. Shop Drawings: Casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, and utility locations, if any.

D. Samples For Color Selection: Wood samples, fully finished, for color and species selection.

E. Verification Samples: Countertop sample.

F. Test Reports: From independent laboratory indicating compliance with referenced chemical-resistance standards for cabinet finish and liner materials.

G. Manufacturer's Installation Instructions.

H. Maintenance Data: Manufacturer's recommendations for care and cleaning.

1.08 WARRANTY

A. Manufacturer will warrant the casework for the life of the product in the application and location installed, starting from the date of acceptance or occupancy, whichever comes first, that all products shall be free from defects in material and workmanship.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. The wood laboratory furniture contractor shall also provide work tops and fume hoods to assure proper staging, shipment and single source responsibility

C. Each cabinet shall be foam and shrink wrapped to ensure cabinet surfaces are protected until the time of installation. Blanket-wrap is not allowed because they do not stay with the cabinets after delivery and because they are not assured of being grease and dirt-freeconstruction activities.

D. One base and one wall cabinet shall be randomly selected by the Architect after delivery of the project for SEFA 8-W testing by an independent lab of the Architect’s choice. Testing shall include both finish and performance standards. Supplier shall include the cost of shipping, testing and replacement of the tested cabinets.

E. Mock-Up: Full size base cabinet complete with drawers, door, adjustable shelf and counter top.
   1. Locate where directed.
   2. Mock up may remain as part of the work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design Products: To establish standards of manufacturer, operation, performance and appearance, drawings and specifications are based on products of the manufacturer (s) listed herein. Provided compliance with requirements, products of other manufacturers may also be acceptable.

B. Wood Laboratory Casework:
   1. Basis of Design: Diversified Casework - Majestic Series. www.diversifiedcasework.com.
   2. Other Acceptable Manufacturers:
      a. Flinn Scientific, Inc.: www.flinnsci.com.

b. Sheldon Laboratory Systems: www.sheldonlabs.com.

3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 WOOD LABORATORY CASEWORK

A. Wood Laboratory Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels.
   1. Style: Flush overlay.
   2. Construction: Provide joints doweled, glued and screwed, except drawers may be lock shoulder jointed; with interior of units smooth and flush; cabinet bottom flush with top of face frame; without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
   3. Structural Performance: In addition to the requirements of SEFA 3, SEFA 7, and SEFA 8W, components safely support the following minimum loads:
      a. Base Units: 500 lbs/linear ft across the cabinet ends.
      b. Suspended Units: 300 lbs static load.
      c. Tables: 300 lbs, minimum, on four legs.
      d. Drawers: 125 lbs, minimum.
      e. Hanging Wall Cases: 300 lbs (136 kg).
      f. Shelves: 100 lbs, minimum.
   4. Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.
   5. Access Panels: Provide access panels for maintenance of utility service and mechanical and electrical components.
   6. Scribes and Fillers: Where cabinets do not fit tight to adjacent construction, provide filler panels of matching construction and finish.
   7. Wood Finish Application: Finishes shall be applied and cured under controlled atmospheric conditions, aided by infrared radiant heaters. Finish must be VOC-free. Finish shall be applied via a flat line system prior to cabinet assembly in order to assure uniform coverage.
   8. Finish: Factory-finish all exposed and semi-exposed surfaces with the same finish.
      a. Finish Performance: Provide finish on all surfaces having chemical resistance of Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8W and no visible effect when surface is exposed to:
         1) Hot water at temperature between 190 degrees F and 205 degrees F trickled down the test surface at 45 degree angle for 5 minutes.
         2) Constant moisture in the form of 2 by 3 by 1 inch thick cellulose sponge kept continually saturated with water and in contact with test surface for 100 hours.
      b. Preparation: Wood sanded smooth, free from dust and mill marks.
      c. Stain: Single application of clean, manufacturer-recommended stain of selected color; tinted coating not acceptable.
      d. Wood Stain Color: Selected from Manufacturer's standard selection.
      e. Coating: Clear, superior-quality, chemical-resistant acyclic urethane; applied in accordance with manufacturer instructions, force-dried, sanded and wiped clean.
      f. Coats: Multiple coats as required to achieve minimum 1.5 mil dry film thickness.
      g. Appearance: Clear satin gloss; not cloudy or muddy.

B. Open-leg Tables: Legs shall be Red Oak hardwood construction, 2-1/4" square with ¼" radius on all corners. Legs shall be secured to the apron frame by a heavy-duty corner bolt and a 13-gauge steel corner brace. Corner braces shall be locked into apron rails by accurately located grooves and shall be securely fastened with screws. All apron rails shall be 13/16" thick solid Red Oak. Top shall be attached using zinc coated screws through pocket holes in the apron. Leg stretchers, where required, shall be 7/8" x 2-1/2", secured with a 4" long through-bolt.

C. Base Cabinets shall consist of the following minimum construction:
   1. Joinery must meet AWI Premium Grade requirements.

2. End panels shall be multiple doweled and glued to top frame members, intermediate rails and bottoms.
3. Cabinet bottoms shall be multiple doweled and glued to end panels.
4. Toe space shall be 4” high and fully enclosed.
5. Edging shall be provided on the front edges of ends, bottoms and shelves, and on all four edges of door and drawer fronts.
6. Cabinet top shall be composed of a single full sub-top composed of a ¾” veneer core plywood that has been doweled and glued to all end panels .
7. Intermediate rails (3/4” x 2-½” hardwood per parts definition) shall be multiple doweled and glued to end panels at the front of the cabinet between drawers and between drawers and doors.
8. Screw strips (3/4” by 3” veneer core hardwood plywood) shall be located at the top and bottom behind the cabinet back and multiple doweled to the cabinet ends.
9. Hardboard cabinet backs shall be fully captured and dadoed into end panels and bottoms, with full perimeter gluing around the rear of the back. Where a removable back is indicated, it shall be an additional piece applied to cover an opening that is added to the fully captured back. (Backs are to meet the visual requirement of cabinet parts.)
10. Shelves shall be ¾” thick in cabinets up to 36” wide, 1” thick in all cabinets over 36” wide. (Front edges of shelves are to meet the visual requirement of cabinet parts.)
11. Drawer box shall be four-sided (sub-front, sides and back), each panel made of nominal ½” thick, 9-ply Baltic Birch plywood and joined to adjacent panels by full glue and multiple dovetail joinery all four corners.
12. Drawer bottom (1/4” on drawers under 42” wide, ½” on larger drawers) shall be melamine faced hardboard (appearance to meet visual appearance of drawer box), dadoed into all four drawer box sides with full perimeter gluing on the underside.
13. Door and drawer heads shall be 3/4" thick plywood with edging as specified to resist warping. Reveals shall be 1/4” between door and drawer heads and ½” on end panels. Face veneers shall be vertically grain matched.
14. Drawer slides shall be easily removable with a 100 lb. dynamic load rating and nylon roller bearings, powder coated surfaces, self-closing and with hold-open feature. Slides shall be attached to the drawer box both from below and the side. File drawers shall be full extension, 150 lb. dynamic load rating mounted to the drawer sides.

D. Full Height Sliding Door Cases:
1. Shall be designed and constructed for full enclosure to assure dust proofing of the interior.
2. Tops shall be 1" thick plywood, multiple doweled into end panels, secured with glue.
3. A double extruded aluminum track shall be attached to the case top for suspension system when sliding doors are called for. Doors shall be suspended from an adjustable hanger and glide on nylon roller wheels. An aluminum U-channel is located on the case bottom to guide the bottom of the doors.
4. Solid panel doors shall be 3/4" thick plywood with edging as specified.
5. Glazed doors shall have 2-3/4" x 7/8" thick framing, mortised, tenoned, and glued. Glass shall be set into door frame and secured with a plastic retainer.
6. Doors shall be removable without use of tools, and so designed to prevent by-passing.
7. Shelves shall be ¾” thick in cabinets up to 36” wide, 1” thick in all cabinets over 36” wide.
8. To assure a rigid case, the center shelf is structurally joined to the end panels and glued.
9. Case bottoms shall be 3/4" thick plywood, multiple doweled and glued securely to end panels.
10. Fastening cleats, top and bottom, ¾” x 3" plywood, shall support and strengthen all joints.
11. Toe space, 2-¼” deep x 4” high, shall be totally enclosed by a ¾” x 4" plywood rail.
12. Backs in open and glazed door cases shall be 1/4" plywood; backs not exposed to view shall be 1/4" high-density fiberboard.
13. Case interior shall be flush.

E. Full Height Swinging Door Cases: General construction features shall be the same as for sliding door cases except for the following:

1. Doors shall overlap opening on all four sides
2. Astragal applied to left hand door shall provide further dust proofing.

F. Wall-Hung Sliding Door Cases: General construction features shall be the same as for full height type cases with the following exception:
   1. Case bottoms shall be 1” thick plywood, multiple doweled and glued securely to end panels.

G. Wall Hung Swinging Door Cases: Construction and materials shall be the same as for sliding door cases with the following exceptions:
   1. Panel or glass framed doors shall be hung on 1 pair of offset, institutional type hinges under 48" in height. Doors on cases 48" high shall have 1-1/2 pair of offset, institutional type hinges.
   2. All doors shall overlap opening four sides.
   3. Astragal applied to left hand door shall provide further dust proofing.

H. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.
   1. Flat Surface Thickness: 1 inch, nominal.
   2. Surface Finish: Smooth, non-glare.
   3. Color: Black.
   4. Back and End Splashes: Same material, same thickness; separate for field attachment.

2.03 MATERIALS

A. Adhesives Used For Assembly: Comply with VOC requirements for adhesives and sealants as specified in Section 01 61 16.

B. Wood-Based Materials:
   1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
   2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

C. Exposed Solid Wood: Clear, dry, sound, plain sawn, selected for compatible grain and color, no defects.

D. Exposed Hardwood Plywood: HPVA HP-1 Grade AA, Type I; veneer core; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.

E. Plywood shall be of balanced construction and ¾” 7-ply veneer core hardwood plywood for shelves, cabinet ends and bottoms of base and tall cabinets; 1” 9-ply veneer core hardwood plywood for shelves over 36”, bottoms of wall and upper cabinets, and tops of wall, upper and tall cabinets; nominal ½” 9-ply veneer core plywood for drawer body; ¾” 3-ply particleboard core plywood for cabinet doors and drawer heads. Plywood shall meet the standards of ANSI/HPVA HP-1-2009.

F. Semi-Exposed Hardwood Plywood: HPVA HP-1 Grade C, Type I; veneer core; plain sliced, any species similar in color and grain to exposed portions.

G. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.

H. Edging for cabinet parts shall be 3 mm hardwood edging of compatible hardwood Red Oak.

I. Hardboard: ANSI A135.4, Class 1, tempered.

J. Stainless Steel Sheet: ASTM A666 Type 304.

K. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 4 mm thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.

L. Cabinet Hardware: Manufacturer's standard styles, exposed components stainless steel.
   1. Finish of Exposed Components: No. 4 finish.

2. Locks when shown or called for shall be a National Lock, 5-disc tumbler with heavy duty interchangeable cylinder. Exposed lock noses shall be dull nickel (satin). Locks shall have capacity for 200 primary key changes. Master key one level with the potential of 200 different, non-interchangeable master key groups.
3. Shelves:
   a. Shelf Standards and Rests: Vertical chrome steel standards with rubber button fitted steel rests.
   b. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.
4. Swinging Doors:
   a. Hinges shall be BHMA Grade 1 of stainless steel, five (5) knuckle institutional, .083" thick, offset type for all swinging doors. Hinges shall be 2- ½" long, one (1) pair for doors under 4 ft. in height and 1-1/2 pair on doors over 4 ft. in height. Hinges are mounted with flathead screws, so applied to door and cabinet to withstand a weight load of 150 lbs. minimum.
   b. Roller catches shall be used on swinging doors. Catches shall have two spring-loaded polyethylene rollers and metal catch to secure doors. Double doors without locks shall have a catch on each door. Full height cases shall have 3-point latching devices. Magnetic catches are not allowed.
   c. Pulls: Chrome wire pulls, 4 inches wide.
5. Drawers:
   a. Drawer and door pulls shall be satin finish, zinc coated wire type, 96 mm centers, offering a comfortable hand grip, and be securely fastened to doors and drawers. Two pulls shall be required on all drawers over 24" long.
   b. Slides: Steel, full extension arms, ball bearings; capacity as recommended by manufacturer for drawer height and width.

M. Leg shoes shall be provided on all table legs, unless otherwise specified, to conceal leveling device. Shoes shall be 2-1/2" high and made of pliable, black rubber material. Use of a leg shoe, which does not conceal leveling device, will not be acceptable.

N. Floor glides, where specified for movable open-leg tables, shall be a non-skid material at least 1" diameter to prevent indenting composition flooring and shall have at least a 5/8" height adjustment. Use of metal buttons will not be acceptable.

O. Dowels used to join frames and panels shall be fluted hardwood not less than 8 mm in diameter.

P. Shelf support clips shall be “seismic” twin pin type for mounting on interior of cabinet work. Clips shall be corrosion resistant and shall retain shelves from accidental removal. Shelves in all cabinets are adjustable on 32mm centers. Single pin support clips and surface mounted metal support strips and clips subject to corrosion are not acceptable.

Q. Base molding and stainless steel corner clips shall be provided by others.

R. Upright rods, cross rods and ring support rods, where specified, shall be aluminum (1/2" or 3/4" dia., as required). Rod sockets shall be aluminum, secured through table tops with lock nut and washer. Rod clamps shall be heavy duty, designed to securely hold rod assembly in any position. Use of wood rod assemblies will not be accepted.

S. Label holders, where shown or called for, shall be a zinc-plated steel, brad-attached type with satin finish and designed for 2" x 1" cards.

T. Number plates, where shown or called for, shall be aluminum brad-attached type with satin finish and indented black lettering.

U. Sink supports, where required, shall be of a cradle type consisting of two 1-1/2” x 3/4” horizontal cleats and adjustable leveling bolts or glides. The horizontal cleats shall be supported by two 1/8” x 1-1/2” angle irons attached to the cabinet end panels.

V. Electrical Outlet Covers: Stainless steel.

W. Sound Deadening Material: Inorganic, for sandwich panel fabrication.

X. Sealant For Use in Casework Construction: Manufacturer's recommended type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of support framing and anchors.

3.02 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions and with SEFA 2.3.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler panels where necessary to close gaps.

E. Replace units that are damaged, including those that have damaged finishes.

3.03 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures, to function smoothly.

3.04 CLEANING

A. Clean all components.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION

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SECTION 12 36 00
COUNTERTOP

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Countertops for architectural cabinet work.

1.03 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Millwork.

1.04 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

F. PS 1 - Structural Plywood; 2009.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Installation Instructions: Manufacturer's installation instructions and recommendations.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Same fabricator as for cabinets on which tops are to be installed.

B. Installer Qualifications: Fabricator.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Plastic Laminate Countertops: High pressure decorative laminate sheet bonded to substrate.
   1. Laminate Sheet, Unless Otherwise Indicated: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
      b. Finish: Matte or suede, gloss rating of 5 to 20.
      c. Surface Color and Pattern: As indicated on drawings.
      d. Manufacturers:
         1) Formica Corporation: www.formica.com.
         2) Wilsonart, LLC: www.wilsonart.com.
         3) Panolam Industries International, Inc\Nevamar: www.nevamar.com.
   2. Back and End Splashes: 3 mm PVC Edgebanding.
   3. Edgeband: 3 mm PVC.
   4. Fabricate in accordance with 1, Section 11 - Countertops, Custom Grade.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
   1. Flat Sheet Thickness: As indicated on Finish Schedule.
   2. Solid Surfacing Sheet: Complying with ISFA-2 and NEMA LD 3; acrylic resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Finish on Exposed Surfaces: Polished, gloss rating of 55 to 80.
      b. Color and Pattern: As indicated on Finish Schedule.
      c. Thickness as indicated on Drawings.
   3. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.

2.02 ACCESSORY MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

B. Particleboard for Supporting Substrate (MDP): ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

D. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches, unless otherwise indicated.

C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect Engineer of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

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SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Manufacturer-engineered, shop-fabricated structural steel building frame.

B. Insulated Metal roof panels including gutters and downspouts and roof mounted equipment curbs.

C. Roof Liner System.

1.03 RELATED REQUIREMENTS

A. Section 01 45 33 - Special Inspections: Code required special tests and inspections.

B. Section 05 50 00 - Metal Fabrications.

C. Section 07 92 00 - Joint Sealers: Sealing joints between accessory components and wall system.

D. Section 09 90 00 - Painting: Field painting.

1.04 REFERENCE STANDARDS

A. AISC 360 - Specification for Structural Steel Buildings; 2010.

B. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

F. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.

G. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2014.

H. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.

I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

J. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).

K. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

N. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2012.

O. FM DS 1-28 - Wind Design; FM Global; 2012.

P. FM DS 1-29 - Loss Prevention Data 1-29, Roof Deck Securement and Above Deck Roof Components; FM Global; 2010.

Q. MBMA (MBSM) - Metal Building Systems Manual; Metal Building Manufacturers Association; 2012.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on profiles, component dimensions, fasteners, roof liner samples of strapping and reinforced pllyethylene vapor retarder fabric.

C. Design Information: Submit a copy (For Information Only) of the Design Information portion of the Metal Building Manufacturer contract prior to preparation of shop drawings.

D. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation, and structural calculations; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths. Shop drawings shall be signed and sealed by a professional engineering licensed to practice in the state where the project is located.

E. Structural Calculations: Include design criteria, loads, deflection, building drift, foundation loads, and loads on lateral load resisting system. Calculations shall be signed and sealed by a professional engineer licensed to practice in the state where the project is located.

F. Samples: Submit two samples of precoated metal panels for each color selected, 24 by 24 inch in size illustrating color and texture of finish.

G. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement.

H. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

I. Manufacturer Qualification Statement: Provide documentation showing metal building manufacturer is accredited under IAS AC472.
   1. Include statement that manufacturer designs and fabricates metal building system as integrated components and assemblies, including but not limited to primary structural members, secondary members, joints, roof, and wall cladding components specifically designed to support and transfer loads and properly assembled components form a complete or partial building shell.

J. Project Record Documents: Record actual locations of concealed components and utilities.

1.07 QUALITY ASSURANCE

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
   1. Design Engineer Qualifications: Licensed in the state where the project occurs.
   2. Conform to applicable code for submission of design calculations and reviewed shop and erection drawings as required for acquiring permits.
   3. Cooperate with regulatory agency or authority and provide data as requested.

B. Perform work in accordance with AISC 360 and MBMA (MBSM).

C. Perform welding in accordance with AWS D1.1/D1.1M.

D. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.
   1. Not less than 3 years of documented experience
   2. Accredited by IAS in accordance with IAS AC472.

E. Erector Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Manufacturer’s Finish Warranty for prefinished roof, soffit and wall panels. Manufacturer's manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finished within specified warranty period
   1. Provide manufacturer's special warranty covering failure of factory-applied exterior finish on metal roof and wall panels and agreeing to repair or replace panels that show evidence of finish degradation, including significant fading, chalking, cracking, or peeling.
   2. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   3. Warranty Period: 20 years from date of Substantial Completion, system warranty shall not be prorated over the life of the warranty.

D. Roof Waterproofing Warranty: Manufacturer agrees to repair or stop any roof leaks attributable to defects in the metal roofing asssembly which includes workmanship, roof panels, fasteners, connectors, , equipment curbs, roof securement components and assemblies and roof flashings, penetration flashings, mastic, closures, and sealants. The manufacturer's limit of liability shall be NO DOLLAR LIMIT.
   1. Warranty Period: 20 years from date of Substantial Completion, system warranty shall not be prorated over the life of the warranty.

E. The General Contractor shall warrant the complete roofing, soffit and wall system workmanship and materials for a period of 5 years after date of Substantial Completion. During the warranty period, Contractor shall, at Contractor’s own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain the said work in watertight conditions.

PART 2 PRODUCTS

2.01 METAL BUILDING SYSTEMS

A. Primary Framing: Rigid frame of rafter beams and columns, canopy beams, intermediate columns, braced end frames, and end wall columns, and wind bracing.

B. Secondary Framing: Purlins, Girts, Eave struts, Flange bracing, Sill supports, and Clips, and other items detailed.

C. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, insulation, and liner sheets, and accessory components.

D. Roof System: Steel deck and preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly and insulation, and accessory components.

2.02 MATERIALS - FRAMING

A. Structural Steel Members: ASTM ASTM A992/A992M, A36 or A572.

B. Structural Tubing: ASTM A500/A500M, Grade B cold-formed.

C. Plate or Bar Stock: ASTM A 529/A 529M, Grade 50 or A36 or A572 Grade 50.

D. Anchor Bolts: ASTM A 36 or F 1554 Grade 36, unprimed.

E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M).

F. Welding Materials: Type required for materials being welded.

G. Wind Bracing: Adjustable, threaded steel rods, 1/2" diameter minimum; ASTM A36 or A572, Grade D.

H. Primer: Manufacturer's standard lead and chromate free primer meeting VOC requirements of authorities having jurisdiction.

I. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.03 MATERIALS - WALLS, SOFFIT, AND ROOF

A. General: Provide roofing and siding sheets formed to general profile or configuration as indicated. Provide flashings, closers, fillers, metal expansion joints, ridge covers, fascias, and other sheet metal accessories, factory formed of same material and finish as roofing and siding.

B. Roof Covering And Supports: The roof construction shall carry an Underwriters Laboratories Construction (Uplift) classification of not less than Class 1-90.
   1. Roof Panels:
      a. The exposed metal roof covering shall be either 24 gage (minimum) commercially pure aluminum-coated or zinc-coated steel panels or 24 gage (minimum) color-coated galvanized steel panels, and of such configuration to provide the specified load carrying capabilities and deflection requirements of this specification. Roof panels shall be of "standing-seam interlocking" design and secured to the purlins with a concealed structural fastening system. The concealed system shall provide minimal through penetration of the exposed roofing surface and allow the roof covering to move independently of any differential thermal movement by the structural framing system. Except at the concealed fasteners, there shall be no thermal contact of the roof panels with the supporting purlin. The standing seams shall have a factory-applied, non-hardening sealant, and the seams shall be continuously locked or crimped together by mechanical means during erection. Roof panels with lap-type side (longitudinal) joints and exposed structural fasteners shall not be considered acceptable. Maximum panel width shall be 16 inches.
      b. Roof panels shall be fastened to the purlins with a concealed clip or backing device of steel having a protective metallic coating. Through penetration of the roofing surface by exposed fasteners shall occur only at terminal locations of the roof panels. Such fasteners shall be stainless steel or aluminum screws, bolts or rivets, with weather-seal washers. Carbon steel shank fasteners with vinyl or stainless steel-capped heads shall be acceptable also.
      c. Deflection of the roof panel shall not exceed L/240 of its span when supporting the applicable vertical live loads previously described.
   2. Purlins:
      a. The purlin's configuration, thickness and spacing shall be the building manufacturer's standard for the condition provided all design criteria, including deflection, is met or exceeded. The purlin bracing system shall comply with AISI or AISC Specification as applicable.
      b. The deflection of the purlin shall not exceed L/180 of its span when supporting the applicable vertical live loads previously described and any collateral loads required.
   3. Roof Jacks and Curbs:
      a. Openings, 8" or smaller, may be flashed and sealed to the roof panel by jacks, providing complete structural support and weathertightness is maintained. Material shall be either of metal with a protective metallic coating or of an EPDM material with an aluminum sealing ring base.
      b. Openings, larger than 8", round or square, shall be framed with a welded metal base fabricated from 0.07" (minimum) thick aluminum or 16 gage (minimum) galvanized steel. The base and its appurtenance shall be supported by the roof purlins and header framing. The base shall have a minimum projection or 8" above the weather surface of the roof, and the configuration of the flanges shall match the roof panel. The flange-to-panel joint shall be sealed with a non-hardening sealant and fastened in such a manner to provide complete support and weathertightness.
      c. All curbs or jacks shall be integral component of the roofing system, designed and supplied by the roofing manufacturer.

C. Wall Coverings and Supports:
   1. Wall Panels:
      a. Metal wall panels shall be the exterior type to which the thermal qualities and various interior finishes are field applied. The metal faces shall be of aluminum or zinc coated steel and shall be supplied with a factory applied color coating. Color shall be selected from those standards with the building manufacturer. Color coated metal panels shall carry a fire hazard rating equal to a Class 1 material as classified by Factory Mutual System.
      b. The covering width and configuration of the panel shall be the building manufacturer's standard provided all design criteria including deflection is met or exceeded. Side seams shall be interlocking concealed or tongue-and-groove. Lap seams are not acceptable.
      c. The wall panel shall be fastened to its supports with clips, screws or bolts located on the inside of the panel or concealed in the joint, thus eliminating exposed primary fasteners. Exposed (non-load-bearing) stainless steel or aluminum screws, bolts and/or rivets shall be acceptable for securing trim, fascias, gutters and miscellaneous flashings to either the wall or roof panels.
      d. The top, bottom and intermediate panel closures, flashings, fascias, gutters and trim shall be the building manufacturer's standard, compatible with the material furnished as wall panels.
   2. Eave Beam:
      a. The beam configuration and thickness shall be the building manufacturer's standard provided all design criteria, including deflection and beam spacing, is met.
      b. Based on a simple span, the deflection of the eave beams (supporting the concrete masonry walls) shall be proportioned with due regard to that produced by the previously prescribed design (wind) load and its effect on the type of interior finish specified hereafter.

D. Finishes:
   1. Fluoropolymer Coating System (Wall and Soffit Panels): Manufacturer’s standard multi-coat thermocured coating system, including minimum 70 percent fluoropolymer color topcoat with minimum total dry film thickness of 0.9 mil; color and gloss as selected from manufacturer’s standards.
   2. Fluoropolymer Coating System (Roof Panels): Galvalume

E. Steel Sheet for metal decking: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M, SS Grade 33/230, with G90/Z275 coating. Metal decking shall be Type B, 1-1/2 inch metal deck, minimum 22 gauge thickness.

2.04 SHEET METAL ACCESSORIES

A. General: Unless otherwise indicated, provide coated steel accessories with coated steel roofing; aluminum accessories with aluminum roofing.

B. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A 153/A 153M, finish to match adjacent surfaces when exterior exposed.

C. Sealant: Manufacturer's standard type.

D. Gutters: Formed in sections not less than 8' 0" in length, complete with end pieces, outlet tubes, and special pieces that may be required. Join sections with riveted and soldered or sealed joints. Unless otherwise indicated, provide expansion type slip joint at center of runs. Furnish gutter supports spaced at 36" o.c., constructed of same metal as gutters. Provide standard bronze, copper, or aluminum wire ball strainers at each outlet. Finish to match roof fascia and rake.

E. Downspouts: Formed in sections approximately 10' 0" long, complete with elbows and offsets. Join sections with minimum 1 1/2" telescoping joints. Provide fasteners for top, bottom, and 5' 0" o.c. intermediately between, designed to securely hold downspouts not less than 1" away from walls. Finish to match wall panels.

F. Ice and Snow Guards: Aluminum bar type with stainless steel clamps for mounting to standing seam roof, of the type which will accept a 2 inch strip of prefinished metal to match the roof color, including all components; "Color Bar" Rail System as manufactured by SNOJAX, or equal.
   1. Furnish aluminum snow and ice clips designed to retard the migration of snow and ice; Model SnoClip II as manufactured by S-5 Attachment Solutions; or equal, www.s-5.com <http://www.s-5.com>. Include all accessories.

2.05 THERMAL INSULATION

A. Roof:
   1. Providing an overall heat transfer (U) value or R-value as indicated below, the insulation system shall be applied under the exposed metal roofing panels.
   2. With blanket-type insulation, a thermal spacer (break) shall separate the roof support member from the roof panel, except at each concealed structural fastener. The spacer shall be of material having a R-value of not less than 8, a density of not less than 2 pcf and, if of a combustible material, shall be classified (ASTM E84) as having a flame spread rating no greater than 25. The blanket type insulation, of required thickness and density, should be placed over the roof support member. The vapor membrane shall always be placed nearest the interior of the building, whether it be exposed or non-exposed. All joints shall be lapped, taped or folded and stapled in accordance with the building manufacturer's standard. The vapor membrane shall have a perm rating of not more than 0.03.
   3. Blanket Insulation: Roof insulation shall be flexible, noncombustible fiberglass blankets vapor resistant membrane, unless otherwise indicated. The vapor resistant membrane shall be a foil scrim type and may be laminated to the insulation as a composite unit or added as a separate component of the insulation system. The above ceiling space is used as a return air plenum. The insulation and vapor membrane, if supplied as a laminated composite unit, shall carry an Underwriters Laboratories, Inc., (UL) Label fire hazard classification indicating a flame spread rating of 25 or less and a smoke developed rating of 50 or less, as a tested assembly. If supplied as separate components, each (tested separately) shall carry the previously specified fire hazard classification.
   4. Thermal Roof Liner System: Basis of Design - Simple Saver System, as manufactured by Thermal Design; www.thermaldesign.com.
      a. Insulation system (with free OSHA compliant through fall protection) manufactured by Thermal Design with an installed total roof insulation R-value of 26 and an average installed thickness of _____ inches. Roof system shall be a (select one): multilayer system. A thermal break shall be applied where there is no existing thermal break between metal panel and metal structure. The thermal break shall be (select one): 3/16" x 3" Quik-Stop™ foam tape, 3/8" Snap-R® thermal block, or 1" Snap-R® thermal block.
      b. Fasteners: #12 x 3/4", plated self-drilling screws with sealing washers painted to match the specified color for fastening to light gauge steel (up to 12 GA purlins) or #12 x 11/4? plated self-drilling screws with sealing washers, painted to match the specified color for heavier gauge steel (up to 3/8? purlins/bar joist). Special fasteners for wood, concrete and other structure types are available from Thermal Design and should be used when appropriate. Always install two (2) fasteners in the end of each strap for safety and to withstand installation stress, and one (1) fastener at all other designated fastening points.
      c. Syseal® Fabric: Shall be woven reinforced high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene film. The fabric grade for the roof shall be (select one): Syseal FP (White), Syseal SW FP (Super White), Syseal SA FP (Silver Aspen), Syseal TT FP (Toni Taupe™), or Syseal BLK FP (Black). The fabric grade for the walls shall be (select one): Syseal FP (White), Syseal SW FP (Super White), Syseal SA FP (Silver Aspen), Syseal TT FP (Toni Taupe™), or Syseal BLK FP (Black). The fabric shall comply with UL/ULC 723 or ASTM E84, and be Class A compliant with a low flame spread index of 25 or less based on ASTM E84 test standards. This material shall be manufactured in large custom pieces by

extrusion welding from roll goods. Pieces shall be fabricated to substantially fit the large defined building areas with minimum practical sealing to be done on job site. Fabric shall be folded to allow for rapid pull-out on the strap support system. The fabric shall be certified for free fall protection by the manufacturer.

d. Syseal liner system fabric perm rating shall (select one):be < 0.02 grains per hour per square foot based on ASTM E96, or not function as a vapor retarder but shall be perforated with 3/16" minimum holes space not more than four (4) inches apart in each direction.
e. Syseal liner system fabric perm rating shall (select one): Sealants: Shall be (select one): Simple Saver System G524 High Tack Sealant™ for sealing vapor retarder laps and/or Simple Saver System G220 Pressure Sensitive Sealant™ and/or Syseal Sticky Tape (double-sided bonding tape) 3/4" wide by 1/32" thick extruded vapor retarder sealant from Thermal Design.
f. Insulation: Shall be formaldehyde free fiberglass blanket or batt insulation meeting ASTM C991 Type 1, ASTM E136 and ASTM E84 or other insulation form as may be recommended and submitted by the system manufacturer and approved by the architect during submittals.
g. Fast-R™ Insulation Hangers: Shall be Fast-R™ preformed, rigid insulation hangers for supporting insulation between wall girts or roof purlins in roof pitches over 4:12. Coiled hangers are not allowed.
h. Thermal Break: Thermal break shall be (select one): 3/16" thick by 3" wide white Quik-Stop™, closed cell polyethylene foam with pre-applied adhesive film and peel-off backing, or 3/8" polystyrene Snap-R thermal block or 1" polystyrene Snap-R thermal block. The selection shall be provided as thermal break where there is no existing thermal break and/or if additional depth space is desired.

2.06 DESIGN CRITERIA

A. Installed Thermal Resistance of Roof System: R-value of 26.

B. Design members to withstand dead load, collateral load, applicable snow load, seismic loads and design loads due to pressure and suction of wind calculated in accordance with applicable code and as indicated in the drawings.

C. Design members and components to withstand FM 1-75 uplift rating in the field with enhanced uplift resistance at the perimeter, ridge, and corners as required by FM DS 1-28, and FM DS 1-29.

D. The complete roof system assembly shall be rated and installed to resist wind loads calculated in accordance with ASCE 7 and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Non-rated systems shall not be installed. Submit licensed engineer's Wind uplift calculations and substantiating data to validate complete roof system. Base wind uplift measurements on an ultimate design wind speed of 115 mph in accordance with ASCE 7 and/or other applicable building code requirements.

E. Roof panels to have a “fixed” ridge with a “floating” eave. Provide for lateral thermal movement in panel configuration or with clip designed for lateral and longitudinal movement.

F. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/120 of span.

G. Deflections shall be limited as follows:
1. Primary Framing:
a. L/240 for roof liveload or snow load
b. L/180 for roof live load (or snow load) plus dead load
c. L/240 for 10-year wind load
2. Secondary Framing:
a. L/180 for roof live load or roof snow load.
b. L/120 for roof dead load plus roof snow load; but not less than that required to maintain positive drainage for the greater of dead load plus 1/2 roof snow load or dead load plus 5 PSF.

c. L/120 for 10-year wind load on walls and roof

H. Horizontal drift of main frame shall not exceed H/200 times the height at the eave. Drift shall be based on columns assumed to be pinned.

I. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

J. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F.

K. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

L. For structural steel design, comply with AISC 360.

M. For light gage steel design, comply with AISI S100.

N. Structural analysis & design shall be based on applicable loads and combination of loads in accordance with more restrictive of the Metal Building Manufacturer's Association (MBMA) "Recommended Design Practices Manual", and International Building Code.

O. For welded connections, comply with AWS D1.1/D1.1M and AWS A2.4.

P. Fire and uplift ratings to comply with Underwriters Laboratories, Inc. and Factory Mutual tests and ratings as specified.

Q. Comply with applicable American Society for Testing Materials (ASTM) Standards as referenced.

R. Comply with Structural Steel Painting Council (SSPC) Standards as referenced.

2.07 FABRICATION - FRAMING

A. Fabricate members in accordance with AISC 360 for plate, bar, tube, or rolled structural shapes.

B. Anchor Bolts: Formed with straight shank with a head or nut tack welded to the rod at the end to be embedded in concrete, assembled with template for casting into concrete.

2.08 FINISHES

A. Framing Members: Clean, prepare, and shop prime. Do not prime surfaces to be field welded.

B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of 70% fluoropolymer finish, color as indicated or as selected from manufacturer's standard range.

C. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of fluoropolymer finish, color as indicated or as selected from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

3.02 ERECTION

A. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.

B. Eave Beams And Purlins: Provide rake or gable purlins with tight fitting closure channels and fascias. Locate and space eave beams to suit door and window arrangements and heights.

C. Bracing: Provide diagonal rod or angle bracing in both roof and sidewalls as required.
1. Moment resisting frames may be used in lieu of sidewall rod bracing, to suit manufacturer's standards.
2. Where diaphragm strength of roof covering is adequate to resist wind forces, rod or other forms of bracing will not be required.

D. Framed Openings: Provide shapes of proper design and size to reinforce opening and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

3.03 ERECTION - FRAMING

A. Erect framing in accordance with AISC 360.

B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.

C. Set column base plates with non-shrink grout to achieve full plate bearing.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.04 ERECTION - WALL AND ROOF PANELS

A. General: Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage. Apply all roofing in strict accordance with the manufacturer's written instructions.

B. Install in accordance with manufacturer's instructions.

C. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.

D. Fasten cladding system to structural supports, aligned level and plumb.

E. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.

F. Provide expansion joints where indicated.

G. Use concealed fasteners.

H. Install sealant and gaskets, providing weather tight installation.

3.05 INSTALLATION - ACCESSORY COMPONENTS IN WALL SYSTEM

A. Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers, and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting. Adjust operating mechanism for precise operation.

B. Thermal Insulation: Install in accordance with manufacturer's published directions, performed concurrently with installation of roof panels.

3.06 THERMAL ROOF LINER SYSTEM

A. Thermal Roof System: Cut to length and install painted steel straps in the pattern and spacings as shown on the project shop drawings. The straps are installed in tension and span immediately below the bottom plane of the purlins. Position the pre-folded vapor retarder liner system fabric on the strap platform along one eave purlin. Clamp the two bottom corners squarely at the eave and centered on the bay. Pull the other end of the pleat-folded fabric across the building width on the strap platform but below the purlins, pausing only at the ridge to fasten the straps and fabric into position where the plane of the roof changes. Once positioned, the remaining fasteners are installed from the bottom side at each purlin/strap intersection and the edges are sealed and trimmed along the rafters. A similar method can be used starting at the ridge purlin space and pulling the fabric to each eave.

B. Insulation is unpacked and placed on the vapor retarder liner system. Shake insulation to the specified thickness and install parallel, between purlins. In multi-layer systems, the upper most layer of insulation is placed over and perpendicular to the purlins as the roof sheeting is applied. It is important that the insulation cavity be filled or the cavities be ventilated to minimize the probability of condensation (ventilated and/or dehumidified roof systems are possible with the Simple Saver System).

3.07 FIELD PAINTING

A. Painting to comply with requirements of Section 09 90 00.

B. Apply finish coating to factory-primed items as follows. Finish colors as selected by Architect Engineer.

C. Cleaning And Touch-Up: Prior to application of finish coats, clean component surfaces of matter which could preclude paint bond.

D. Touch-up abrasions, marks, skips or other defects to shop-primed surfaces with same type material as shop primer.

E. Coordination: Provide finish coats which are compatible with prime paints used. Provide barrier coats over incompatible primers where required. Notify Architect Engineer in writing of anticipated problems using specified coatings with substrates primed by others.

3.08 TOLERANCES

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch from true position.

C. Structural steel shall be erected plumb, level and aligned, with a tolerance not exceeding a proportional error of 1 to 500. Other fabrication and erection tolerances are as stated in the Metal Building Manufacturer's Association's Low Rise Building Systems Manual, 1996 edition, "Common Industry Practices."

3.09 QUALITY CONTROL

A. An independent testing and inspection agency acceptable to the Architect Engineer shall perform field quality control inspections and tests, as specified in Section 01 45 33 - Special Inspections.

B. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

C. Visual Inspection Of Field Welding: Testing agency shall visually inspect field welding while the operators are making the welds and again after the work is completed. The welder or welding operator's identification mark shall be stamped on the steel so that the full and complete identity and history of the welding operation will be known. After the welding is completed, hand or power wire brush welds and thoroughly clean them before the inspector makes the check inspection. Inspect welds with magnifiers under strong, adequate light for surface cracking, porosity, and slag inclusions; excessive roughness, unfilled craters, gas pockets, undercuts, overlaps, size, and insufficient throat and concavity. Inspect the preparation of groove welds for adequate throat opening and for snug positioning of back up bars.

D. Field Bolted Connections: All connections including rod bracing shall be visually inspected to insure quantity and tested per AISC.

E. Field Welding: Inspect and test during erection of structural steel as follows:
   1. Certify welders and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.
   2. Perform visual inspection of all field welds.
   3. Perform tests on welds not passing visual inspection as follows:
      a. Liquid Penetrant Inspection: ASTM E165.
      b. Magnetic Particle Inspection: ASTM E109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.

F. All column anchor bolts shall be visually inspected for size, quantity and completeness.

G. Copy of the laboratory report shall be submitted to the Architect Engineer for review.

H. Connections that are found unsatisfactory by the inspecting laboratory, shall be corrected as directed, at the Contractor's expense, and to the satisfaction of the inspector. A copy of the final report shall be submitted to the Architect Engineer for approval.
   1. Correction of Defective Welds: Weld areas containing defects exceeding the standards of acceptance in AWS D1.1 shall be corrected in accordance with AWS D1.1 Section 3.7. Additional testing of the repaired areas shall be made at the Contractor's expense. If 20% or more of the tests of welds made by a given welder contain defects requiring repair,

100% radiographic inspection of that welder's work will be required at the Contractor's expense.

2. Connections shall not be covered or made inaccessible until the final approval is obtained.

I. Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories at the start, midpoint of installation, and final installation, minimum. Report results in writing.

END OF SECTION

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SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 91 23 - Interior Painting: Preparation and painting of interior fire protection piping systems.

C. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.

D. Section 21 13 00 - Fire Suppression Sprinklers: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.

C. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2011.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.

E. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2011.

F. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

G. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

H. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.

I. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2013.

J. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

K. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

L. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.

M. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

N. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.

O. AWWA C606 - Grooved and Shouldered Joints; 2011.

P. FM (AG) - FM Approval Guide; current edition.

Q. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

R. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Project Record Documents: Record actual locations of components and tag numbering.

E. Operation and Maintenance Data: Include installation instructions and spare parts lists.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Valve Stem Packings: Two for each type and size of valve.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified this section.
   1. Minimum three years experience.
   2. Approved by manufacturer.

C. Conform to FM (AG) and UL (DIR) requirements.

D. Valves: Bear FM (AG) and UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.

E. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

F. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 FIRE PROTECTION SYSTEMS

A. Sprinkler Systems: Conform to NFPA 13.

B. Welding Materials and Procedures: Conform to ASME BPVC-IX.

2.02 BURIED PIPING

A. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Fittings: AWWA C110/A21.10, standard thickness.
   2. Joints: AWWA C111/A21.11, rubber gasket.
   3. Mechanical Couplings: Shaped composition sealing gasket, steel bolts, nuts, and washers.

2.03 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASTM A234/A234M, wrought carbon steel or alloy steel, ASME B16.5, steel flanges and fittings, or ASME B16.11, forged steel socket welded and threaded.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   4. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

2.04 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.

B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Not required for wall hydrants for fire department connections or in drywall construction.

D. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material conforming to ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

2.05 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, split ring.

2.06 MECHANICAL COUPLINGS

A. Manufacturers:
   1. Victaulic Company; FireLock Style 009H: www.victaulic.com.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig.
   3. Housing Material: Fabricate of ductile iron conforming to ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
   6. Bolts and Nuts: Hot dipped galvanized or zinc electroplated steel.
   7. Provide stops for direct stab installation without field assembly.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:
   1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   2. Place hangers within 12 inches of each horizontal elbow.

3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
1. Painting of interior fire suppression systems is specified in Section 09 91 23.

I. Structural Considerations:
1. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
a. Pack solid using mineral fiber conforming to ASTM C592.
b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with fire stopping material conforming to ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

K. Escutcheons:
1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

M. Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21 05 23

GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Iron butterfly valves with indicators.

B. Check valves.

C. Iron OS&Y gate valves.

D. NRS gate valves.

E. Indicator posts.

F. Trim and drain valves.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.

C. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

D. Section 21 13 00 - Fire Suppression Sprinklers.

E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

F. Section 28 31 00 - Fire Detection and Alarm.

G. Section 33 11 16 - Site Water Utility Distribution Piping.

1.03 ABBREVIATIONS AND ACRONYMS

A. EPDM: Ethylene-propylene diene monomer.

B. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

C. NRS: Non-rising stem.

D. OS&Y: Outside screw and yoke.

E. PTFE: Polytetrafluoroethylene.

1.04 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2010.

C. ASME B31.9 - Building Services Piping; 2014.

D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

E. AWWA C606 - Grooved and Shouldered Joints; 2011.

F. FM (AG) - FM Approval Guide; current edition.

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

H. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

I. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.

J. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.

K. UL 789 - Indicator Posts for Fire-Protection Service; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

B. Where listed products are specified, provide products listed, classified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for the purpose indicated.

C. Welding Materials and Procedures: Conform to ASME BPVC-IX.

D. Installer Qualifications:
   1. Company specializing in performing the work of this section with minimum five years documented experience.
   2. Trained and approved by manufacturer to design, install, test and maintain the equipment specified herein.
   3. Complies with manufacturer's certification requirements.
   4. Complies with manufacturer's insurance requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and weld ends.
   3. Set valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors and maintain at higher than ambient dew point temperature.
      b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

C. Use the following precautions for handling:
   1. Use sling to handle large valves, rigged to avoid damage to exposed parts.
   2. Do not use operating handles or stems as lifting or rigging points.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
   1. Main Level: HAMV - Fire Main Equipment.
      a. Level 1: HCBZ - Indicator Posts, Gate Valve.
      b. Level 1: HLOT - Valves.
      c. Level 3: HLUG - Ball Valves, System Control.
      d. Level 3: HLXS - Butterfly Valves.
      e. Level 3: HMER - Check Valves.
      f. Level 3: HMRZ - Gate Valves.
   2. Main Level: VDGT - Sprinkler System & Water Spray System Devices.
      a. Level 1: VQGU - Valves, Trim, and Drain.

B. FM Global Approved: Provide valves listed in FM (AG) Approval Guide under the following headings:
   1. Automated Sprinkler Systems:
      a. Indicator posts.
      b. Valves:
         1) Gate valves.
         2) Single check valves.
         3) Miscellaneous valves.

C. ASME Compliance:
   1. ASME B16.1 for flanges on iron valves.
   2. ASME B1.20.1 for threads on threaded-end valves.
   3. ASME B31.9 for building services piping valves.

D. Comply with AWWA C606 for grooved-end connections.

E. Comply with NFPA 13 for valves.

F. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Actuator Types:
   1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
   2. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

2.02 IRON BUTTERFLY VALVES WITH INDICATORS

A. UL and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 112.

B. Minimum Pressure Rating: 175 psig.

C. Body Material: Cast or ductile iron with nylon, EPDM, epoxy, polyamide, or _____ coating.

D. Seat: EPDM.

E. Stem: Stainless steel.

F. Disc: Ductile iron, nickel plated.

G. Actuator: Worm gear or traveling nut.

H. Supervisory Switch: Internal or external.

I. Body Design: Grooved-end connections.

2.03 CHECK VALVES

A. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.

B. Minimum Pressure Rating: 175 psig.

C. Type: Center guided check valve.

D. Body Material: Cast iron, ductile iron.

E. Center guided check with elastomeric seal.

F. Hinge Spring: Stainless steel.

G. End Connections: Flanged, grooved, or threaded.

2.04 IRON OS&Y GATE VALVES

A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).

B. Minimum Pressure Rating: 175 psig.

C. Body and Bonnet Material: Cast or ductile iron.

D. Wedge: Cast or ductile iron, or bronze with elastomeric coating.

E. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.

F. Stem: Brass or bronze.

G. Packing: Non-asbestos PTFE.

H. Supervisory Switch: External.

I. End Connections: Flanged.

2.05 NRS GATE VALVES

A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).

B. Minimum Pressure Rating: 175 psig.

C. Body and Bonnet Material: Cast or ductile iron.

D. Wedge: Cast or ductile iron with elastomeric coating.

E. Wedge Seat: Cast or ductile iron, or bronze with elastomeric coating.

F. Stem: Brass or bronze.

G. Packing: Non-asbestos PTFE.

H. Supervisory Switch: External.

I. End Connections: Flanged.

2.06 INDICATOR POSTS

A. Type: Underground.

B. Base Barrel Material: Cast or ductile iron.

C. Extension Barrel for Adjustable Length Indicator Posts: Cast or ductile iron.

D. Cap: Cast or ductile iron.

E. Operation: Wrench.

2.07 TRIM AND DRAIN VALVES

A. Ball Valves:
   1. Description:
      a. Pressure Rating: 175 psig.
      b. Body Design: Two piece.
      c. Body Material: Forged brass or bronze.
      d. Port Size: Full or standard.
      e. Seat: PTFE.
      f. Stem: Bronze or stainless steel.
      g. Ball: Chrome-plated brass.
      h. Actuator: Hand-lever.

PART 3 EXECUTION

3.01 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage.
   1. Check bolting for proper size, length, and material.
   2. Verify gasket for size, defects, damage, and suitable material composition for service.
   3. Replace all defective valves with new valves.

3.02 INSTALLATION

A. Comply with specific valve installation requirements and application in the following Sections:

1. Section 21 13 00 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
2. Section 33 11 16 for application of valves in fire-suppression water-service piping outside the building.

B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
   1. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in water supply connections and backflow preventer at potable water supply connections.

D. Valves with threaded connections to have unions at equipment arranged for easy access, service, maintenance, and equipment removal without system shutdown.

E. Valves in horizontal piping installed with stem at or above the pipe center.

F. Position valves to allow full stem movement.

G. Install valve tags. Comply with Section 21 05 53 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

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SECTION 21 05 48

FIRE SUPPRESSION VIBRATION ISOLATION AND SEISMIC RESTRAINT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Restraining braces for Fire Protection piping.

B. For equipment and situations not addressed in this Section, Section 230548 takes precedence.

1.03 RELATED REQUIREMENTS

A. Section 23 05 48 - Heating, Ventilation and Air-Conditioning (HVAC) Vibration Isolation And Seismic Restraint.

B. Section 26 05 48 - Electrical Vibration Isolation And Seismic Restraint.

C. Section 26 05 29 - Electrical: Hangers and supports: Vibration isolation and seismic restraint.

D. Section 27 05 48 - Communications Vibration Isolation And Seismic Restraint.

E. Section 28 05 48 - Electronic Safety And Security Vibration Isolation And Seismic Restraint.

1.04 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.05 REFERENCED STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2011.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems, 2013.

C. ASTM E488

1.06 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
   1. Site Class as Defined in the IBC.
   2. Occupancy Category as Defined in the IBC.
   3. Seismic Design Category as Defined in the IBC.
   4. Design Spectral Response Acceleration at Short Periods (0.2 Second).
   5. Least radius of gyration for rigid bracing shall not be less than l/r=200.
   6. See drawings for seismic design criteria.

1.07 SUBMITTALS

A. Product Data: For the following:
   1. Include the rated load, rated deflection, and overload capacity for each vibration or seismic isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
      b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including

analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators, and for designing vibration isolation bases.
2. Seismic Restraint Details:
   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
   c. Preapproval and Evaluation Documentation: By an evaluation service member if ICC-ES or an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and basis for approval (tests or calculations).

C. Welding certificates.

D. Qualification Data: For professional engineer and testing agency.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in CFR 1910.7, and is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC, ASCE-7 and NFPA 13 unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 PRODUCTS

2.01 SEISMIC RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, as appropriate:
   1. TOLCO Incorporated, a brand of NIBCO INC.
   2. AFCON
   3. Loos & Co.
   4. Hilti, Inc.
   5. Powers Fasteners
   6. Simpson Strong-Tie

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.
   1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected. Follow manufacturer's maximum design loads reduced as appropriate.

C. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with

strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

D. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 EXECUTION

3.01 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:
   1. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Piping Restraints:
   1. Comply with requirements in NFPA 13 and applicable building codes.
   2. Space lateral supports a maximum of 40 feet on center, and longitudinal supports a maximum of 80 feet on center, reduced by brace components and maximum zone of influence weights.
   3. Brace a change of direction longer than 6 feet

C. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for component.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
   1. All attachments to structure on plans and in the field will be reviewed by the Structural Engineer and subject to their comments.
   2. Lateral braces may not be attached to the bottom chord of a bar joist.
   3. Bolts through the middle of the bottom chord of a bar joist are not acceptable.
   4. All bracing to bar joists must occur within 6" of a panel point.
   5. Braces may not be attached to steel deck.

E. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Set anchors to manufacturer's recommended torque, using a torque wrench.
   5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.
   6. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward surface in such a manner as to avoid introduction of air pockets in adhesive.

3.02 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one

supporting the connections as they approach equipment. Comply with requirements in Division 21 Section "Water-Based Fire-Suppression Systems" for piping flexible connections.

3.03 FIRE SUPPRESSION VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE SCHEDULE

A. Designer needs to indicate on drawings each piece of equipment or piping requiring seismic restraint and details of each type of restraint used as required by authorities having jurisdiction.

3.04 SPECIAL INSPECTIONS

A. All seismic restraints are to undergo special inspection.

END OF SECTION

SECTION 21 13 00
FIRE SUPPRESSION SPRINKLERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 21 05 00 - Common Work Results for Fire Suppression: Pipe and fittings.

C. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.

D. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

F. Section 28 31 00 - Fire Detection and Alarm.

1.04 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.

F. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

G. NFPA 1963 - Standard for Fire Hose Connections; 2014.

H. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

I. UL 405 - Fire Department Connection Devices; Current Edition; Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect Engineer.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

G. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.07 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Conform to FM (AG) requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State of Arkansas.

D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

E. Installer Qualifications: Company specializing in performing the work of this section documented experience and approved by manufacturer.

F. Equipment and Components: Provide products that bear FM (AG) label or marking.

G. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.08 MOCK-UP

A. Provide components for installation in mock-up.

B. Mock-up may not remain as part of the Work.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
   1. Viking Corporation; _____: www.vikinggroupinc.com.
   2. Victaulic
   3. Reliable Sprinkler.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.
   1. Revise design when test data available prior to submittals.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.

3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.03 SPRINKLERS

A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Brass.
   4. Cover Plate Finish: Enamel, color White.
   5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Upright type with guard.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Enamel, color White.
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Dry Sprinklers: Exposed sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Chrome plated.
   4. Escutcheon Plate Finish: Chrome plated.
   5. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler finish.

E. Flexible Drop System: Stainless steel, multiple use, open gate type.
   1. Application: Use to properly locate sprinkler heads.
   2. Include all supports and bracing.
   3. Provide braided type tube as required for the application.
   4. Manufacturers:
      a. Victaulic Company; Vic-Flex: www.victaulic.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.
   4. Manufacturers:
      a. Victaulic Company; Series 751 with Series 760 motor alarm: www.victaulic.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Backflow Preventer: Double check valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Test Connections:
   1. Inspector's Test Connection for Preaction Systems:
      a. Provide test connections approximately 6 ft above floor for each or portion of each sprinkler system equipped with an alarm device, located at the most remote part of each system.
      b. Route test connection to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
      c. Supply discharge orifice with same size as corresponding sprinkler orifice.
      d. Limit vertical height of exterior wall penetration to 2 ft above finished grade.

2. Backflow Preventer Test Connection:
    a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch National Standard male hose threads with cap and chain.
    b. Furnish one valve for each 250 gpm of system demand or fraction thereof.
    c. Provide permanent sign reading "Test Valve" in accordance with Section 22 05 53.

D. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

F. Fire Department Connections:
1. Type: Flush, wall mount made of corrosion resistant metal complying with UL 405.
    a. Inlets: Two way, 2-1/2 inch swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
    b. Configuration: Horizontal.
    c. Outlet: With pipe threads, 4 NPS.
        1) Location: Back.
    d. Rated Working Pressure: 175 psi.
    e. Finish: Polished brass.
    f. Signage: Raised or engraved lettering 1 inch minimum indicating system type.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Install buried shut-off valves in valve box. Provide post indicator.

D. Provide approved double check valve assembly at sprinkler system water source connection.

E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent siamese connectors to allow full swing of fire department wrench handle.

F. Locate outside alarm gong on building wall as indicated.

G. Place pipe runs to minimize obstruction to other work.

H. Place piping in concealed spaces above finished ceilings.

I. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

J. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

K. Flush entire piping system of foreign matter.

L. Install guards on sprinklers in Gymnasium and where sprinklers are installed below 7'-0".

M. Hydrostatically test entire system.

N. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 22 05 10
BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 PROJECT MANAGEMENT

A. Drawings are diagrammatic, all offsets, fitting, valves and accessories are not shown. Refer to all drawings in the contract documents and plan work accordingly. Coordinate with all trades and crafts.

B. In case of interference between trades, Architect Engineer will decide which work is to take precedence regardless of work that might be installed.

1.03 CODES, ORDINANCES, INSPECTIONS, AND PERMITS

A. Execute and inspect Work in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of Work.

B. Should any part of Drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Architect Engineer, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the Architect Engineer. Any work performed knowingly in violation of codes shall be corrected without additional expense to the Owner or his representative.

C. All plumbing work shall comply with latest local codes and the the State of Arkansas plumbing code.

D. Arrange with County, City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford Architect Engineer and all authorized inspectors every facility for inspection and be responsible for all violations of law. Upon completion of Work, have Work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to Architect Engineer. Comply with Division 01.

1.04 COORDINATION

A. Conduct multi-trade coordination and preinstallation meetings to establish bottom elevations of all piping, ductwork and conduit before fabrication and installation. Comply with Division 01.

B. All equipment shall be installed in accordance with the manufacturer's recommendations. It is the contractor's responsibility to follow all installation requirements and guidelines provided in the manufacture's installation manual. If there is a conflict with regards to installation, the contractor shall stop work and notify the design Architect Engineer representative.

1.05 SUBMITTALS

A. Comply with Division 01.

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for plumbing fixtures, plumbing specialties, plumbing equipment, and others as may be requested.

C. Shop Drawings: Miscellaneous steel for pipe support, duct support, pipe guides, anchors, and miscellaneous steel used for supporting any mechanical equipment.

1.06 SUBSTITUTIONS

A. Comply with Division 01.

B. Any proposed substitutions of equipment shall be accompanied by shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged

connections, such connections shall be installed to the complete satisfaction of Architect Engineer without additional cost to Owner.

C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall replace this material or equipment with that as originally specified, or corrected as directed by Architect Engineer.

1.07 CLEAN UP

A. Comply with Division 01.

B. Do not allow waste material or rubbish to accumulate in or about job site.

C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

1.08 EQUIPMENT START-UP AND SYSTEM COORDINATION

A. Comply with Division 01.

B. The Contractor shall be responsible for placing all equipment and system components into operation. Individual components shall be coordinated with other parts of Mechanical, Electrical, Plumbing and/or Fire Protection Systems to ensure that the entire project functions as designed and described by the contract documents.

1.09 CUTTING AND PATCHING

A. Comply with Section 01 17 00 - Execution and Closeout Requirements.

B. Provide all cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction.

1.10 DEMOLITION

A. Comply with Section 02 41 00 - Demolition.

B. Alterations and Minor Demolition: Comply with Section 01 17 00 - Execution and Closeout Requirements.

1.11 RECORD DOCUMENTS

A. Comply with Division 01.

1.12 OPERATION INSTRUCTIONS

A. Comply with Division 01.

B. Printed instructions, installed in a suitable frame with a glass front, covering the operation and maintenance of each major item of equipment, shall be posted at locations designated by the Architect Engineer. Provide 2 bound manuals containing complete repair parts lists, and operating service and maintenance instructions for all equipment provided.

1.13 INSTRUCTION

A. Comply with Section 01 79 00 - Demonstration and Training.

1.14 FLASHINGS

A. Refer to Division 07 for roof flashings.

1.15 ACCESS PANELS

A. Comply with Section 08 31 00 - Access Doors.

B. Provide access panels as necessary for servicing of fire dampers, smoke dampers, valves, VAV terminals and any other equipment in concealed spaces.

1.16 PAINT EXTERIOR PIPING

A. All exterior steel piping shall be painted using a metal primer coat, second coat of enamel, top coat of enamel and a finish coat of gloss.

B. Natural gas piping shall be painted yellow.

1.17 DOMESTIC WATER PIPING

A. Valve, strainer and other domestic water piping specialties shall be bronze, brass, stainless steel or epoxy coated cast iron only for the services that are in contact with domestic water.

B. No cast iron valves, strainers or any other accessories that contact domestic water are allowed without epoxy coating.

1.18 LOCAL SITE CONDITIONS

A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are not to be assumed as being accurate.

B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.

1.19 GUARANTY-WARRANTY

A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Architect Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.

B. All materials and equipment shall be new and unused and shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.

1.20 EQUIPMENT CONNECTIONS

A. Each equipment item with drain connections, shall be provided with a properly-sized drain run to the nearest floor drain or as directed.

B. Rough-in and make final connection to all equipment requiring same, furnished under other Divisions of these specifications or by the Owner.
   1. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
   2. If equipment or fixtures to be furnished by Owner and/or Owner's vendor are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are in the hands of the trade doing the work.

1.21 ELECTRICAL

A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the electrical plans and specifications, for proper operation and control of all equipment specified under this Division of the specifications.

B. Provide variable frequency drive controllers on all HVAC fan and pump motors that are three phase powered regardless if they serve a constant flow or variable flow system.

C. Supervise and coordinate all electrical work in connection with mechanical system.

1.22 MOTOR CONTROLLERS

A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors.

B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. This schedule shall be submitted within 45 days of Notice to Proceed to Architect Engineer and supplier of motor control center for approval.

C. Provide magnetic starters and with overload protection for single phase motors larger than 1/2 horsepower and all 3 phase motors. Starters for 3-phase motors shall have 3-pole overload

protection. All starters shall have pilot lights. Starters being controlled by other devices shall have "hand"-"off"-"auto" switches. Starters being controlled locally shall have push button stations mounted on starter or remote. Provide auxiliary contacts as required. Provide manual starter with overload on all motors 1/2 HP or less that are not inherently protected, and if required for remote control, a magnetic contactor.

D. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

1.23 EXCAVATION, TRENCHING, AND BACKFILLING

A. All excavation, trenching and backfilling in connection with the mechanical system, to a point 5'0" outside the building, is included as part of this Division.

B. All excavation required shall be done as part of the bid price regardless of any implied conditions on the plans or in these specifications.

C. Excavation to have 12 inch minimum and 24 inch maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means any water accumulated in excavation.

D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench to be 5 inches minimum, 8 inches maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8 inches below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.

E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Architect Engineer, or to conform to governing laws.

F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4 inch layers, tamped under and around pipe and conduit to height of at least 2'0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8 inch layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests in accordance with Division 31 may be required by the Architect Engineer, with the costs paid by the Contractor.

G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 22 05 48

PLUMBING VIBRATION ISOLATION AND SEISMIC RESTRAINT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 INTENT

A. Plumbing vibration isolation and seismic restraint shall comply with the requirements of Section 230548 - Heating, Ventilation and Air-Conditioning (HVAC) Vibration Isolation And Seismic Restraint.

B. All isolators and isolation materials for the Project shall be of the same manufacturer and shall be certified by the manufacturer.

1.03 RELATED REQUIREMENTS

A. Section 230548 - Heating, Ventilation and Air-Conditioning (HVAC) Vibration Isolation And Seismic Restraint.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe Markers.

1.03 RELATED REQUIREMENTS

A. Section 09 90 00 - Painting and Coating: Identification painting.

1.04 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Piping: Tags.

B. Pumps: Nameplates.

C. Small-sized Equipment: Tags.

D. Tanks: Nameplates.

E. Thermostats: Nameplates.

F. Valves: Tags .

G. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:
   1. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   2. Seton Identification Products: www.seton.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Black.
   4. Plastic: Conform to ASTM D709.

2.03 TAGS

A. Manufacturers:
   1. Advanced Graphic Engraving: www.advancedgraphicengraving.com.
   2. Brady Corporation: www.bradycorp.com.
   3. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   4. Seton Identification Products: www.seton.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradycorp.com.
   2. Kolbi Pipe Marker Co.: www.kolbipipemarkers.com.
   3. MIFAB, Inc.: www.mifab.com.
   4. Seton Identification Products: www.seton.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Comply with ASME A13.1.

C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

E. Color code as follows:
   1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
   2. Toxic and Corrosive Fluids: Orange with black letters.
   3. Flammable Fluids: Yellow with black letters.
   4. Combustible Fluids: Brown with white letters.
   5. Compressed Air: Blue with white letters.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

END OF SECTION

SECTION 22 07 19
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 90 00 - Painting and Coating: Painting insulation jacket.

C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

1.04 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2010.

C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2013.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

E. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2013.

F. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 2010.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

H. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

J. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2013.

K. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

L. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.08 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

2.02 GLASS FIBER

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 850 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum service temperature: 650 degrees F.
   3. Maximum moisture absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

2.03 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      a. Johns Manville Corporation: www.jm.com.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   3. Joining: Longitudinal slip joints and 2 inch laps.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. Glass fiber insulated pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 7 feet (2 meters) above finished floor): Finish with aluminum jacket.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

L. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply and Recirculation:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: 2 inch and smaller.
            (a) Thickness: 1 inch.
         2) Pipe Size Range: Over [2] inch ([50] mm).
            (a) Thickness: [1.5] inch ([40] mm).
   2. Domestic Cold Water:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All Sizes
            (a) Thickness: [1] inch ([25] mm).
   3. Roof Drain Bodies:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All Sizes
            (a) Thickness: [1] inch ([25] mm).

4. Roof Drainage Above Grade:
    a. Glass Fiber Insulation:
        1) Pipe Size Range: All Sizes
            (a) Thickness: [1] inch ([25] mm).

B. Other Systems:
1. Heat Maintenance Cable:
    a. Per Manufacturer's instructions.
2. Piping Exposed to Freezing with Heat Tracing:
    a. Per Manufacturer's instructions.
3. Handicap Fixture Traps, Stops and Supplies:
    a. Manufactured Glass Fiber covering with PVC jacket. (Refer to FIxture Schedules).
4. Provide aluminum jacket for all piping exposed to weather or damp locations.

END OF SECTION

SECTION 22 10 05
PLUMBING PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Pipe, pipe fittings, valves, and connections for piping systems.
   1. Sanitary sewer.
   2. Chemical resistant sewer.
   3. Domestic water.
   4. Natural Gas.
   5. Flanges, unions, and couplings.
   6. Pipe hangers and supports.
   7. Valves.
   8. Flow controls.
   9. Check.
   10. Water pressure reducing valves.
   11. Relief valves.
   12. Strainers.

1.03 RELATED REQUIREMENTS

A. Section 22 0510 - Basic Plumbing Requirements

B. Section 31 23 16 - Excavation.

C. Section 31 23 23 - Fill.

D. Section 31 23 16.13 - Trenching.

E. Section 33 13 00 - Disinfecting of Water Utility Distribution.

F. Section 07 84 00 - Firestopping.

G. Section 09 91 23 - Interior Painting.

H. Section 22 05 16 - Expansion Fittings and Loops for Plumbing Piping.

I. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

J. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

K. Section 22 07 19 - Plumbing Piping Insulation.

L. Section 31 23 16 - Excavation.

M. Section 31 23 23 - Fill.

N. Section 33 13 00 - Disinfecting of Water Utility Distribution.

1.04 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2011.

F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.

G. ASME B31.1 - Power Piping; 2014.

H. ASME B31.9 - Building Services Piping; 2014.
I. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.
J. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).
K. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
L. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.
M. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
N. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.
O. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
P. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a.
Q. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.
R. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.
S. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
T. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2010.
U. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2002 (Reapproved 2010).
V. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
W. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Plastic Pipe, Schedules 40, 80, and 120; 2012.
X. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.
Y. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2014.
Z. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
AA. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
AB. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2014.
AC. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
AD. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
AE. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.
AF. ASTM E84 - Standard Specification for "Standard Test Method for Surface Burning Characteristics of Building Materials" - (Flame Spread/Smoke Development).
AG. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
AH. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
AI. AWWA C606 - Grooved and Shouldered Joints; 2011.

AJ. AWWA C651 - Disinfecting Water Mains; 2005.

AK. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009.

AL. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011.

AM. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2012.

AN. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2012.

AO. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

AP. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2013.

AQ. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

AR. MSS SP-67 - Butterfly Valves; 2011.

AS. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; 2011.

AT. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.

AU. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.

AV. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; 2011.

AW. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

AX. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

AY. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.08 FIELD CONDITIONS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 extra heavy weight.
   1. Fittings: Cast iron.
   2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. Copper Tube: ASTM B306, DWV.
   1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
   2. Joints: ASTM B32, alloy Sn50 solder.

C. PVC Pipe: ASTM D2729.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Copper Pipe: ASTM B42, hard drawn, Type K.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
   2. Joints: ASTM B 32, alloy Sn95 solder.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Mechanical Press Sealed Fittings: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.

2.06 NATURAL GAS PIPING, BURIED BEYOND 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type, with AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.
   2. Joints: ASME B31.1, welded.

B. Polyethylene Pipe: ASTM D2513, SDR 11.
   1. Fittings: ASTM D2683 or ASTM D2513 socket type.
   2. Joints: Fusion welded.

2.07 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASTM A234/A234M, wrought steel welding type.
   2. Joints: ASME B31.1, welded.
   3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

2.08 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
2. Joints: Threaded or welded to ASME B31.1.

2.09 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:
   1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
   2. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.
   5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
   6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High density polypropylene.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
      e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

B. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
   4. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
6. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
7. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
8. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.11 GATE VALVES

A. Up To and Including 2 inch (50 mm).
1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder or threaded ends.

B. 2-1/2 inches (50 mm) and larger:
1. MSS SP-70, Class 125, iron body, with epoxy coated interior, bronze trim, outside screw and yoke, handwheel, solid wedge disc, flanged ends. Provide gear-type operator on valves 4" and larger. Provide chain-gear operators for valves mounted over 8 feet (2400 mm) above floor.

2.12 GLOBE VALVES

A. Up To and Including 2 inch (50 mm).
1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder or threaded ends.

B. 2-1/2 inches (50 mm) and larger:
1. MSS SP-85, Class 125, iron body, with epoxy coated interior, outside screw and yoke, handwheel, renewable bronze plug-type disc, renewable seat, flanged ends. Provide gear-type operator on valves 4" and larger. Provide chain-gear operators for valves mounted over 8 feet (2400 mm) above floor.

2.13 BALL VALVES

A. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded, or grooved ends with union. Ductile iron valves shall have epoxy coated interiors.

2.14 PLUG VALVES

A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, with epoxy coated interior, pressure lubricated, teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.15 BUTTERFLY VALVES

A. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.

B. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

2.16 FLOW CONTROLS

A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Calibration: Control flow within five percent of selected rating, over operating pressure range of ten times minimum pressure required for control, maximum minimum pressure 3.5 psi.

C. Construction: Body and all internal components shall be constructed of stainless steel with major components constructed of type 303 stainless steel. Circuit Solver sizes ½ inch through 2 inch shall be rated to 200 PSIG maximum working pressure. Standard tapered female pipe thread, NPT. Rated to 300° F (148.9°C) maximum working temperature.

2.17 SWING CHECK VALVES

A. Up to 2 Inches:
   1. 1, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.

B. Over 2 Inches:
   1. MSS SP-71, Class 125, iron body, with epoxy coated interior, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

2.18 SPRING LOADED CHECK VALVES

A. Class 125, iron body, with epoxy coated interior, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.

2.19 WATER PRESSURE REDUCING VALVES

A. Up to 2 Inches:
   1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

B. Over 2 Inches:
   1. ASSE 1003, cast iron body, with epoxy coated interior, bronze fitted, elastomeric diaphragm and seat disc, flanged.

2.20 RELIEF VALVES

A. Pressure Relief:
   1. 1 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

B. Temperature and Pressure Relief:
   1. 2 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity 1 certified and labelled.

2.21 STRAINERS

A. Size 2 inch and Under:
   1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 1-1/2 inch to 4 inch:
   1. Class 125, flanged iron body, epoxy coated, Y pattern with 1/16 inch stainless steel perforated screen.

C. Size 5 inch and Larger:
   1. Class 125, flanged iron body, expoxy coated, basket pattern with 1/8 inch stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

L. Excavate in accordance with Section 31 23 16.

M. Backfill in accordance with Section 31 23 23.

N. Install bell and spigot pipe with bell end upstream.

O. Install valves with stems upright or horizontal, not inverted.

P. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.

Q. Install water piping to ASME B31.9.

R. Install fuel oil piping to ASME B31.9.

S. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

T. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

U. Sleeve pipes passing through partitions, walls and floors.

V. PVC Pipe shall not be installed in air plenums in accordance with ASTM E84

W. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

X. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as scheduled.

3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 05 48.
11. Support cast iron drainage piping at every joint.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

E. Install globe valves for throttling, bypass, or manual flow control services.

F. Provide spring loaded check valves on discharge of water pumps.

G. Provide plug valves in natural gas systems for shut-off service.

H. Provide flow controls in water recirculating systems where indicated.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 13 00.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
   2. Provide 18 gage, 0.0478 inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

C. Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 7 inch wg. Provide regulators on each line serving gravity type appliances, sized in accordance with equipment.

3.08 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe size: 1/2 inches to 1-1/4 inches:
         1) Maximum hanger spacing: 6.5 ft.
         2) Hanger rod diameter: 3/8 inches.
      b. Pipe size: 1-1/2 inches to 2 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 3/8 inch.
      c. Pipe size: 2-1/2 inches to 3 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 1/2 inch.
      d. Pipe size: 4 inches to 6 inches:
         1) Maximum hanger spacing: 10 ft.
         2) Hanger rod diameter: 5/8 inch.
      e. Pipe size: 8 inches to 12 inches:
         1) Maximum hanger spacing: 14 ft.
         2) Hanger rod diameter: 7/8 inch.
      f. Pipe size: 14 inches and Over:
         1) Maximum hanger spacing: 20 ft.
         2) Hanger rod diameter: 1 inch.
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum hanger spacing: 6 ft.
         2) Hanger rod diameter: 3/8 inch.

END OF SECTION

SECTION 22 10 06
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Hose bibbs.
D. Hydrants.
E. Washing machine boxes and valves.
F. Backflow preventers.
G. Water hammer arrestors.
H. Interceptors.
I. Manhole Risers
J. Thermostatic mixing valves.

1.03 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Procedures for [Owner]-supplied products.
B. Section 22 10 05 - Plumbing Piping.
C. Section 22 40 00 - Plumbing Fixtures.
D. Section 22 30 00 - Plumbing Equipment.
E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
B. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).
C. ASME A112.6.4 - Roof, Deck, and Balcony Drains; The American Society of Mechanical Engineers; 2003.
D. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).
E. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2009 (ANSI/ASSE 1012).
F. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers; American Society of Sanitary Engineering; 2011.
G. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2011 (ANSI/ASSE 1019).
H. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2013.
I. NSF 61 - Drinking Water System Components - Health Effects; 2012.
J. NSF 372 - Drinking Water System Components - Lead Content; 2011.
K. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2010.
L. NSF 61 - Drinking Water System Components - Health Effects; 2012.
M. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Certificates: Certify that grease interceptors meet or exceed specified requirements.

E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

F. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.

G. Operation Data: Indicate frequency of treatment required for interceptors.

H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Floor Drain (See Schedule on Drawings):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

B. Floor Drain (See Schedule on Drawings):
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with raised flange.

C. Floor Sink (See Schedule on Drawings):
   1. Square lacquered cast iron body with integral seepage pan, epoxy coated interior, aluminum dome strainer, clamp collar, full grate.

2.03 CLEANOUTS

A. Cleanouts at Exterior Surfaced and Unsurfaced Areas (COTG/DCOTG):
   1. Line type with lacquered heavy duty cast iron body and round epoxy coated gasketed cover.

B. Cleanouts at Interior Finished Floor Areas (FCO):
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

C. Cleanouts at Interior Finished Wall Areas (WCO):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.04 HOSE BIBBS

A. Interior Hose Bibbs:

1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in conformance with ASSE 1011.

2.05 HYDRANTS

A. Wall Hydrants:
   1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and integral vacuum breaker.

2.06 WASHING MACHINE BOXES AND VALVES

A. Description: Plastic preformed rough-in box with brass long shank valves with wheel handles, socket for 2 inch waste, slip in finishing cover.

2.07 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventers:
   1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.08 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

2.09 INTERCEPTORS

A. **GREASE INTERCEPTORS**: (See Schedule on Drawings)
   1. Construction:
      a. Precast concrete complying with ASTM C 913.
      b. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, and piping or openings to retain grease and to permit wastewater flow.
   2. Structural Design Loads:
      a. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
   3. Resilient Pipe Connectors:
      a. ASTM C 923, cast or fitted into interceptor walls for each pipe connection.
   4. Steps:
      a. Individual FRP steps or FRP ladder, 1/2-inch steel reinforcing rods encased in ASTM D 4101, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12-to 16-inchintervals. Omit steps if total depth from floor of interceptor to finished grade is less than 60 inches.
   5. Grade Rings:
      a. Reinforced-concrete rings, 6-to 9-inch total thickness, to match diameter of manhole frame and cover.
   6. Manhole Frames and Covers:
      a. Ferrous; 24-inch ID by 7-to 9-inch riser with 4-inchminimum width flange and 26-inch-diameter cover.
      b. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
      c. Gray Iron: ASTM A 48, Class 35, unless otherwise indicated.
      d. Include indented top design with lettering cast into cover, using wording equivalent to "GREASE INTERCEPTOR".
      e. Capacities and Characteristics: As scheduled on drawings.

2.10 PRECAST-CONCRETE MANHOLE RISER

A. Precast-Concrete Manhole Risers: ASTM C 478, with rubber-gasket joints.

1. Structural Design Loads:
   a. Heavy-Traffic Load: Comply with ASTM C 890, A-16 (ASSHTO HS20-44).
2. Length: From top of underground concrete structure to grade.
3. Riser Sections: 3-inch minimum thickness and 36-inch diameter.
4. Top Section: Eccentric cone, unless otherwise indicated. Include top of cone to match grade ring size.
5. Gaskets: ASTM C 443, rubber.

B. Grade Rings: Reinforced-concrete rings, 6-to 9-inch total thickness, diameter matching manhole frame and cover, and height as required to adjust the manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers: Ferrous; diameter to match cover by 7-to 9-inch riser with 4-inch-minimum width flange and diameter to match cover.
1. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
2. Gray Iron: ASTM A 48, Class 35, unless otherwise indicated.
3. Include indented top design with lettering cast into cover, using wording equivalent to the following: Mark as interceptor served.

2.11 MIXING VALVES

A. Thermostatic Mixing Valves:
1. Valve: Cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
2. Accessories:
   a. Check valve on inlets.
   b. Volume control shut-off valve on outlet.
   c. Stem thermometer on outlet.
   d. Strainer stop checks on inlets.

B. Pressure Balanced Mixing Valves:
1. Valve: Chrome plated cast brass body, stainless steel cylinder, integral temperature adjustment.
2. Accessories:
   a. Strainer stop checks on inlets.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to all quick closing valves. .

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

I. Install precast-concrete interceptors according to ASTM C 891. Set level and plumb.

J. Install manhole risers from top of underground concrete interceptors to manholes and grating sat finished grade.

K. Set tops of manhole frames and covers flush with finished grade and/or surface.

L. Set tops of grating frames and grates flush with finished surface.

3.02 CONNECTIONS

A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

3.03 IDENTIFICATION

A. Identification materials and installation are specified in Section 312000 "Earthwork." Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.

1. Use warning tapes or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

END OF SECTION

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SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Water heaters.

B. Water storage tanks.

C. Expansion tanks.

D. Pumps.
   1. Circulators.

E. Water pressure booster system.

1.03 RELATED REQUIREMENTS

A. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

B. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2014.

B. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2015.

C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.

D. ICC (IPC) - International Plumbing Code; 2012.

E. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

F. UL 778 - Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

G. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Current Edition, Including All Revisions.

H. NSF 61 - Drinking Water System Components - Health Effects; 2012.

I. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

C. Shop Drawings:

1. Indicate heat exchanger dimensions, size of tappings, and performance data.
2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

D. Manufacturer's Instructions: Indicate clearances and connection requirements.

E. Project Record Documents: Record actual locations of components.

F. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS

A. A.O. Smith Water Products Co; _____: www.hotwater.com.

B. Rheem Manufacturing Company; _____: www.rheem.com.

C. Lochinvar Corporation: www.lochinvar.com

D. State Industries: www.stateind.com

E. PVI Corporation: www.pvi.com

F. Rinnai Inc.:www.rinnai.us

G. Eemax, Inc.:www.eemaxinc.com

H. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 CERTIFICATIONS

A. Water Heaters: NSF approved.

B. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.03 COMMERCIAL GAS FIRED WATER HEATERS

A. Type: Automatic, natural gas-fired, vertical storage.

B. Performance:

C. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.

D. Accessories: Provide:

1. Water Connections: Brass.
2. Dip tube: Brass.
3. Drain Valve.
4. Anode: Magnesium.
5. Temperature and Pressure Relief Valve: ASME labelled.

E. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F, automatic reset high temperature limiting thermostat factory set at 195 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

F. Controls: Automatic direct immersion thermostat with temperature range adjustable minimum 175 degrees F differential, automatic reset high temperature limiting thermostat factory set at 195 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, intermittent electronic ignition monitoring pilot and main flame, trial for re-ignition for momentary loss of flame, shut down of pilot and main burner in 2-4 seconds after loss of flame, and automatic flue damper.

2.04 COMMERICAL TANKLESS GAS WATER HEATERS

A. Type: Automatic, condensing, natural gas-fired, tankless.

B. Construction: Metal powder coated cabinet, copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity. Pressure rated at 150 psig, copper tubing heat exchanger, Gas burner with automatic ignition.

C. Accessories: Provide:
1. Water Connections: Brass, lead free, water service connection kit.
2. Drain Valve.
3. Temperature and Pressure Relief Valve: ASME labelled.
4. Metal wall mounting bracket.
5. Gas shutoff valve.
6. Piping Manifold Kit: Water heater manufacturer's factory-fabricated inlet and outlet piping arrangement for multiple-unit installation. Include piping and valves for field assembly that is capable of isolating each water heater and of providing balanced flow through each water heater.
7. Contoller: MC-91-1US (included), Deluxe controller: MC-100V-1US (optional)
8. Contoller Cable: Non-polarized two-core cable, minimum 22 AWG.
9. Flue: Proprietary venting system by Rinnai (NO PVC)

D. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F (49 to 82 degrees C), automatic reset high temperature limiting thermostat factory set at 195 degrees F (90 degrees C), gas pressure regulator, Direct electronic ignition, modulating burner, 100 percent safety shut-off pilot and thermocouple. Water flow sensor, electronic water control and by-pass control. Anti-frost protection cabinet heating element.

2.05 EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.

2.06 IN-LINE CIRCULATOR PUMPS

A. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against a stationary ceramic seat.

E. Drive: Flexible coupling.

2.07 PRESSURE BOOSTER SYSTEMS

A. System: Packaged with three pumps, factory assembled, tested, and adjusted; shipped to site as integral unit; consisting of pumps, valves, and galvanized piping, with control panel assembled on fabricated steel base with structural steel framework.

B. Controls and Instruments: Locate in NEMA 250 Type 1 general purpose enclosure with main disconnect interlocked with door, fused circuit for each motor, magnetic starters with three overloads, control circuit transformer with fuse protection, selector switch for each pump, low limit pressure switch, low pressure alarm light, running lights, current sensing devices, minimum run timers, manual alternation, and suction and discharge pressure gages.

C. Lead Pump: Operate continuously with lag pump operating on system demand. Should lead pump fail to operate, next pump in sequence shall start automatically.

D. Time Delay Relay: Prevent lag pump short cycling on fluctuating demands.

E. Thermal Bleed Circuit with Solenoid Valve: Prevent overheating during low demand.

F. Low Pressure Control: Stop pump operation if incoming water pressure drops to atmospheric.

G. Pump Switch: Permit manual or automatic operation.

H. Valving: System discharge combination pressure reducing and check valve to maintain constant system pressure. Provide gate or butterfly valves on suction and discharge of each pump.Provide check valve on each pump discharge.

I. Time Clock for Automatic Day-Night Changeover:
   1. Day cycle: System shall operate continuously with pressure to fixtures maintained by pressure reducing valves.
   2. Night Cycle: Pumps shall operate intermittently on pressure switch located near pressure tank operating pump for pre-determined adjustable time period.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Domestic Water Storage Tanks:
   1. Provide steel pipe support, independent of building structural framing members.
   2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

D. Pumps:
   1. Ensure shaft length allows sump pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches clearance from bottom of sump pit.
   2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Service sinks.

F. Electric water coolers.

G. Showers.

H. Eye and face wash fountains.

I. Emergency showers.

1.03 RELATED REQUIREMENTS

A. Section 07 90 05 - Joint Sealers: Seal fixtures to walls and floors.

B. Section 22 10 05 - Plumbing Piping.

C. Section 22 10 06 - Plumbing Piping Specialties.

D. Section 22 30 00 - Plumbing Equipment.

E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. ANSI Z124.1.2 - American National Standard for Plastic Bathtub and Shower Units; 2005.

B. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2009.

C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008.

D. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).

E. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2012.

F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008 (R2013).

G. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures; The American Society of Mechanical Engineers; 1994 (R2004).

H. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers; 2011.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2014.

J. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; International Surface Fabricators Association; 2013.

K. NSF 61 - Drinking Water System Components - Health Effects; 2012.

L. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Manufacturer's Instructions: Indicate installation methods and procedures.

D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.07 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
   1. Flush Valve: Exposed (top spud).

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
   1. Sensor-Operated Type: Solenoid operator, low voltage hard-wired, infrared sensor and over-ride push button.
   2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

C. Seats:
   1. Manufacturers: (See Schedule on Drawings).
      a. American Standard, Inc: www.americanstandard-us.com.
      b. Bemis Manufacturing Company: www.bemismfg.com.
      c. Church Seat Company: www.churchseats.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

2.03 WALL HUNG URINALS

A. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
   1. Flush Volume: (See Schedule on Drawings), maximum.
   2. Flush Style: Washout.
   3. Flush Valve: Exposed (top spud).

4. Trap: Integral.
5. Removable stainless steel strainer.

B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Sensor-Operated Type: Solenoid operator, low voltage hard-wired, infrared sensor and over-ride push button.
2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
3. Manufacturers: (See Schedule on Drawings).
a. American Standard, Inc: www.americanstandard-us.com.
b. Sloan Valve Company: www.sloanvalve.com.
c. Zurn Industries, Inc: www.zurn.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Carriers:
1. Manufacturers: (See Schedule on Drawings).
a. Wade Drain (Tyler Pipe): www.wadedrains.com
b. Zurn Industries, Inc: www.zurn.com.
c. Substitutions: See Section 01 60 00 - Product Requirements.
2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, with 4 inch (100 mm) high back, rectangular basin with splash lip, front overflow, and soap depression.

B. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.

C. Supply Faucet Manufacturers: (See Schedule on Drawings).
1. American Standard, Inc: www.americanstandard-us.com.
2. Kohler Company: www.kohler.com.
3. Chicago Faucets: www.chicgofaucets.com
4. Zurn Industries, Inc: www.zurn.com.
5. Substitutions: See Section 01 60 00 - Product Requirements.

D. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
1. Spout Style: Standard.
2. Power Supply: Battery, easily replaceable, alkaline or lithium, minimum 200,000 cycles.
a. Low battery indicator warning light at 30 days remaining life and continuous light a 2 weeks.
3. Mixing Valve: See Schedule on Drawings.
4. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
5. Finish: Polished chrome.

E. Accessories:
1. Chrome plated 17 gage, 0.0538 inch brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Screwdriver stops.
4. Flexible supplies.
5. Carrier:
a. Manufacturers: (See Schedule on Drawings).
1) Wade Drain (Tyler Pipe): www.wadedrains.com
2) Zurn Industries, Inc: www.zurn.com.
3) Substitutions: See Section 01 60 00 - Product Requirements.
b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.05 SINKS

A. Sink configurations:
   1. Self rimming Single Compartment Bowl: ASME A112.19.3; 20 gage (0.9 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   2. Under-mount Single Compartment Bowl: ASME A112.19.3; 20 gage (0.9 mm) thick, Type 302 stainless steel, under-mount and undercoated, with ledge back drilled for trim.
   3. Self-rimming Double Compartment Bowl: ASME A112.19.3; 20 gage (0.9 mm) thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   4. Under-mount Double Compartment Bowl: ASME A112.19.3; 20 gage (0.9 mm) thick, Type 302 stainless steel, under-mount and undercoated, with ledge back drilled for trim.

B. Supply Faucet Manufacturers: (See Schedule on Drawings).
   1. American Standard, Inc: www.americanstandard-us.com.
   2. Kohler Company: www.kohler.com.
   3. Chicago Faucets: www.chicgofaucets.com
   4. Zurn Industries, Inc: www.zurn.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

C. Manual Faucet: ASME A112.18.1; chrome plated combination supply fitting without pop-up waste, water economy aerator with maximum flow of 2.2 gallons per minute (8.3 liters per minute), indexed handles.

D. Accessories:
   1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
   2. Offset waste with perforated open strainer.
   3. Wheel handle stops.
   4. Flexible supplies.

2.06 SHOWERS

A. Cabinet: ANSI Z124.1.2 gelcoat reinforced glass fiber, with slip-resistant textured floor, integral receptor, soap dish, integral seat, removable chrome plated strainer with tail piece.

B. Cabinet: ANSI Z124.1.2 gelcoat reinforced glass fiber, with slip-resistant textured floor, integral receptor, soap dish, removable chrome plated strainer with tail piece.

C. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum flow, and escutcheon.

D. Shower Head:
   1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm flow control.

E. Low-Flow Shower Head:
   1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.

2.07 ELECTRIC WATER COOLERS

A. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
   1. Capacity: 8 gallons per minute of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
   2. Electrical: 115 V, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.

2.08 SERVICE SINKS

A. Bowl: 24 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, stainless steel bumper guards stainless steel strainer.

B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

C. Accessories:
   1. 3 feet of 1/2 inch diameter plain end reinforced rubber hose.
   2. Hose clamp hanger.
   3. Mop hanger.
   4. Stainless steel wall panels.

2.09 EMERGENCY EYE AND FACE WASH

A. Emergency Wash: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads , copper alloy control valve and fittings.

2.10 EMERGENCY SHOWERS

A. Emergency Shower: ANSI Z358.1; free standing, self- cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

G. Replace all batteries with name brand-long life batteries at the end of construction.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 05 10
BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 PROJECT MANAGEMENT

A. Drawings are diagrammatic, all offsets, fitting, valves and accessories are not shown. Refer to all drawings in the contract documents and plan work accordingly. Coordinate with all trades and crafts.

B. In case of interference between trades, Architect Engineer will decide which work is to take precedence regardless of work that might be installed.

1.03 CODES, ORDINANCES, INSPECTIONS, AND PERMITS

A. Execute and inspect Work in accordance with local and state codes, laws, ordinances, rules and regulations applicable to particular class of Work.

B. Should any part of Drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Architect Engineer, in writing, 72 hours prior to receiving of bids. After the receiving of bids, any discovery of code violations shall be promptly reported to the Architect Engineer. Any work performed knowingly in violation of codes shall be corrected without additional expense to the Owner or his representative.

C. All mechanical work shall comply with latest local codes and the the State of Arkansas mechanical code (2010 Arkansas Mechanical Code).

D. Arrange with County, City, or State, if City has no ordinances covering work, for complete inspection, paying all charges pertaining thereto. Give proper authority all requisite notice relating to work under such; afford Architect Engineer and all authorized inspectors every facility for inspection and be responsible for all violations of law. Upon completion of Work, have Work inspected, if required, obtaining certificate of inspection and approval from inspecting agency and deliver such certificate to Architect Engineer. Comply with Division 01.

1.04 COORDINATION

A. Conduct multi-trade coordination and preinstallation meetings to establish bottom elevations of all piping, ductwork and conduit before fabrication and installation. Comply with Division 01.

B. All equipment shall be installed in accordance with the manufacturer's recommendations. It is the contractor's responsibility to follow all installation requirements and guidelines provided in the manufacture's installation manual. If there is a conflict with regards to installation, the contractor shall stop work and notify the design Architect Engineer representative.

1.05 SUBMITTALS

A. Comply with Division 01.

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for plumbing fixtures, plumbing specialties, plumbing equipment, HVAC equipment, HVAC piping specialties, air distribution devices and others as may be requested.

C. Shop Drawings: Miscellaneous steel for pipe support, duct support, pipe guides, anchors, and miscellaneous steel used for supporting any mechanical equipment.

1.06 SUBSTITUTIONS

A. Comply with Division 01.

B. Any proposed substitutions of equipment shall be accompanied by shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged

connections, such connections shall be installed to the complete satisfaction of Architect Engineer without additional cost to Owner.

C. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall replace this material or equipment with that as originally specified, or corrected as directed by Architect Engineer.

1.07 CLEAN UP

A. Comply with Division 01.

B. Do not allow waste material or rubbish to accumulate in or about job site.

C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep clean mechanical systems shall be repaired without cost to Owner.

1.08 EQUIPMENT START-UP AND SYSTEM COORDINATION

A. Comply with Division 01.

B. The Contractor shall be responsible for placing all equipment and system components into operation. Individual components shall be coordinated with other parts of Mechanical, Electrical, Plumbing and/or Fire Protection Systems to ensure that the entire project functions as designed and described by the contract documents.

1.09 CUTTING AND PATCHING

A. Comply with Division 01.

B. Provide all cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction.

1.10 RECORD DOCUMENTS

A. Comply with Division 01.

1.11 OPERATION INSTRUCTIONS

A. Comply with Division 01.

B. Printed instructions, installed in a suitable frame with a glass front, covering the operation and maintenance of each major item of equipment, shall be posted at locations designated by the Architect Engineer. Provide 2 bound manuals containing complete repair parts lists, and operating service and maintenance instructions for all equipment provided.

1.12 INSTRUCTION

A. Comply with Section 01 79 00 - Demonstration and Training.

1.13 FLASHINGS

A. Refer to Division 07 for roof flashings.

1.14 ACCESS PANELS

A. Comply with Section 08 31 00 - Access Doors.

B. Provide access panels as necessary for servicing of fire dampers, smoke dampers, valves, VAV terminals and any other equipment in concealed spaces.

1.15 PAINT EXTERIOR PIPING

A. All exterior steel piping shall be painted using a metal primer coat, second coat of enamel, top coat of enamel and a finish coat of gloss.

B. Natural gas piping shall be painted yellow.

1.16 LOCAL SITE CONDITIONS

A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are not to be assumed as being accurate.

B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply as to condition of soil to be encountered.

1.17 GUARANTY-WARRANTY

A. This guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the true intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Architect Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.

B. All materials and equipment shall be new and unused and shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections.

1.18 EQUIPMENT CONNECTIONS AND INSTALLATION

A. Each equipment item with drain connections, shall be provided with a properly-sized drain run to the nearest floor drain or as directed.

B. Rough-in and make final connection to all equipment requiring same, furnished under other Divisions of these specifications or by the Owner.
   1. Provide necessary labor and materials, including stop valves, traps, pressure-reducing valves, etc. necessary. Trap and vent drainage connections as required.
   2. If equipment or fixtures to be furnished by Owner and/or Owner's vendor are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are in the hands of the trade doing the work.

D. Unless another form of vibration isolation is used, all equipment shall be mounted at least on neoprene pads.

1.19 ELECTRICAL

A. Furnish and install all electrical interlock, control and other wiring, not covered specifically under the electrical plans and specifications, for proper operation and control of all equipment specified under this Division of the specifications.

B. Supervise and coordinate all electrical work in connection with mechanical system.

1.20 MOTOR CONTROLLERS

A. Furnish all motor controllers or contactors, not furnished as part of a motor control center, for proper operation of all motors.

B. Where motor controllers or contactors are furnished as part of a motor control center, provide a schedule of every motor or equipment item furnished, its voltage requirements, type controller required, accessories required and interlocks. This schedule shall be submitted within 45 days of Notice to Proceed to Architect Engineer and supplier of motor control center for approval.

C. All starters and switches shall be in a proper NEMA enclosure and shall be identified with engraved laminated plastic label.

1.21 EQUIPMENT FEATURES

A. All belt driven fans shall include an automatice belt tensioner to maintain belt tension after start-up.

1.22 EXCAVATION, TRENCHING, AND BACKFILLING

A. All excavation, trenching and backfilling in connection with the mechanical system, to a point 5'0" outside the building, is included as part of this Division.

B. All excavation required shall be done as part of the bid price regardless of any implied conditions on the plans or in these specifications.

C. Excavation to have 12 inch minimum and 24 inch maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel or concrete, as directed by Architect Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone or clean sand and thoroughly compact. Architect Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavations to prevent water running in. Remove, by pumping or other means any water accumulated in excavation.

D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench to be 5 inches minimum, 8 inches maximum on each side of pipe bell. Bottom of trench for sewers and culverts shall be rounded so that an arc of circumference equal to 0.6 of outside diameter or pipe rests on undisturbed soil wherever practicable. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8 inches below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.

E. Bracing, sheathing and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Architect Engineer, or to conform to governing laws.

F. After piping, conduit, ducts, etc. have been installed, inspected, tested and approved by governing agency, backfill trenches with clean, stable soil free from stones. Place backfill in 4 inch layers, tamped under and around pipe and conduit to height of at least 2'0" above pipe. Tamping shall be done in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8 inch layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests in accordance with Division 31 may be required by the Architect Engineer, with the costs paid by the Contractor.

G. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless otherwise directed.

1.23 SEISMIC QUALIFICATION OF EQUIPMENT

A. Provide manufacturer's certificate of compliance for the following equipment requiring seismic qualifications.
   1. Air handling equipment
   2. Heat Exchangers

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 23 05 53

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

1.03 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.04 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Product Data: Provide manufacturers catalog literature for each product required.

E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Automatic Controls: Tags. Key to control schematic.

D. Control Panels: Nameplates.

E. Dampers: Ceiling tacks, where located above lay-in ceiling.

F. Ductwork: Nameplates.

G. Heat Transfer Equipment: Nameplates.

H. Instrumentation: Tags.

I. Major Control Components: Nameplates.

J. Piping: Tags.

K. Pumps: Nameplates.

L. Small-sized Equipment: Tags.

M. Thermostats: Nameplates.

2.02 NAMEPLATES

A. Manufacturers:

B. Letter Color: White.

C. Letter Height: 1/4 inch.

D. Background Color: Black.

E. Plastic: Conform to ASTM D709.

2.03 TAGS

A. Manufacturers:

B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
   2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
   3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
   4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
   5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
   6. Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

2.05 PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09 91 23 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Apply stencil painting in accordance with Section 09 91 23.

D. Install plastic pipe markers in accordance with manufacturer's instructions.

E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

G. Use tags on piping 3/4 inch diameter and smaller.

H. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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SECTION 23 05 48

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 DESCRIPTION

A. Intent:
   1. All equipment, piping, ductwork and electrical distribution as noted on the equipment schedule or in the specification shall be mounted using vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
   2. All isolators and isolation materials for the Project shall be of the same manufacturer and shall be certified by the manufacturer.
   3. It is the intent of the seismic portion of this specification to keep all life-safety, plumbing, mechanical and electrical building system components in place during a seismic event.
   4. All such systems shall be installed in strict accordance with seismic codes, component manufacturer's requirements and building construction standards. Whenever a conflict occurs between the manufacturer's requirements or construction standards, the most stringent shall apply.
   5. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent, national, state or local construction requirements (i.e. California Title 24, California OSHPD, Canadian Building Codes, or other requirements).
   6. Any variance or non-compliance with these specification requirements shall be corrected in an Architect Engineer approved manner and without additional expense to the Owner.
   7. Seismic restraints shall be designed in accordance with seismic design criteria as indicated on drawings and ASCE-7 chapter 13.

B. The work in this section includes, but is not limited to the following:
   1. Vibration isolation for piping, ductwork and equipment.
   2. Equipment isolation bases.
   3. Flexible piping connections.
   4. Seismic restraints for isolated equipment.
   5. Seismic restraints for non-isolated equipment.
   6. Certification of seismic restraint designs and installation supervision.
   7. Certification of seismic attachment of housekeeping pads.
   8. All life-safety, plumbing, mechanical and electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included.
   9.

1.03 RELATED SECTIONS

A. Section 210548 (13914) - Fire Suppression Vibration Isolation And Seismic Restraint.

B. Section 220548 (15072) - Plumbing Vibration Isolation And Seismic Restraint.

C. Section 260529 (16070) - Electrical: Hangers and supports: Vibration isolation and seismic restraint.

1.04 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

B. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2011.

G. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

H. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors' National Association; 2008.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product literature documenting compliance with PART 2 PRODUCTS.
   2. Include seismic rating documentation for each isolator and restraint component accounting for horizontal, vertical, and combined loads.

C. Shop Drawings:
   1. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
      a. Descriptive Data:
         1) Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
         2) Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
      b. Shop Drawings:
         1) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
         2) Provide all details of suspension and support for ceiling suspended equipment.
         3) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe shall be included and approved before the condition is accepted for installation. Submittals shall include spacing, static loads and seismic loads at all attachment and support points.
         4) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
      c. Seismic Certification and Analysis:
         1) Seismic restraint calculations shall be provided for all connections of equipment to the structure. Calculations shall be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the project location.
         2) Restraining devices shall be preapproved by a recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs shall be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the project location. Testing and calculations shall include shear and tensile loads as well as one test or analysis at 45-degrees to the weakest mode.
         3) Analysis shall indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis shall detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces calculated according to the Codes and Standards referenced on the Structural

Drawings acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

D. See Section 013000 (01300) - Administrative Requirements, for submittal procedures.

1.06 CODE AND STANDARDS REQUIREMENTS

A. Applicable codes and standards are referenced on the drawings.

B. ASCE-7, Chapter 13

1.07 MANUFACTURER'S RESPONSIBILITY

A. Manufacturer of vibration isolation and seismic control equipment shall have the following responsibilities:
   1. Determine vibration isolation and seismic restraint sizes and locations.
   2. Provide vibration isolation and seismic restraints as scheduled or specified.
   3. Provide calculations and materials if required for restraint of unisolated equipment.
   4. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.

1.08 RELATED WORK

A. Housekeeping Pads:
   1. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the supplier of restraints, if not already indicated on the drawings.
   2. Housekeeping pads shall be coordinated with the supplier of restraints and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embedment.

B. Supplementary Support Steel: Provide supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment, as required or specified.

C. Attachments: Provide restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.

PART 2 PRODUCTS

2.01 INTENT

A. All vibration isolators and seismic restraints described in this section shall be the product of a single manufacturer.
   1. Mason Industries' products are the basis of these specifications; products of other manufacturers are acceptable provided their systems strictly comply with the specification and have the approval of the Architect Engineer.
   2. Substitutions: See Section 016000 (01600) - Product Requirements.
   3. Submittals and certification sheets shall be in accordance with paragraph Submittals.
   4. For the purposes of this project, failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8 inch (3 mm) and/or horizontal permanent deformation greater that 1/4 inch (6 mm).

2.02 PRODUCT DESCRIPTIONS

A. Vibration Isolators and Seismic Restraints:
   1. Type 1: Two layers of 3/4 inch (19 mm) thick neoprene pad consisting of 2 inches (50 mm) square waffle modules separated horizontally by a 1/16 inch (1.5 mm) gauge galvanized shim. Load distribution plates shall be used as required. Pads shall be equal to type Super W as manufactured by Mason Industries, Inc.
   2. Type 2: Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2 inch (5 mm) and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements

shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall be UL listed for seismic restraint. Mountings shall be equal to type BR as manufactured by Mason Industries, Inc.

3. Type 3: Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality. Bushing assemblies shall be equal to type PB as manufactured by Mason Industries, Inc.
4. Type 4: A one piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal to metal contact. Neoprene bushings shall be equal to type HG as manufactured by Mason Industries, Inc.
5. Type 5: Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4 inch (6 mm) neoprene acoustical friction pad between the base plate and the support. All mountings shall have leveling bolts that shall be rigidly bolted to the equipment. Spring diameters shall be no less than 80% of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be equal to type SLF as manufactured by Mason Industries, Inc.
6. Type 6: Restrained spring mountings shall have an SLF mounting as described in Type 5, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. Installed and operating heights are equal. A minimum clearance of 1/2 inch (12 mm) shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Restraining Bolts shall have a neoprene bushing between the bolt and the housing. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there shall be an internal isolation pad. Housing shall be designed to resist all seismic forces. Mountings shall be UL listed for seismic restraint. Mountings shall be equal to type SLR or SLRS as manufactured by Mason Industries, Inc.
7. Type 7: Spring mountings as in Type 5 built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4 inch (6 mm) travel in all directions before contacting the resilient snubbing collars. Mountings shall be UL listed for seismic restraint. Mountings shall be equal to type SSLFH as manufactured by Mason Industries, Inc.
8. Type 8: Air Springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall be multiple bellows to achieve a maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus 1/8 inch (3 mm). Submittals shall include natural frequency, load and damping tests performed by an independent lab or acoustician. Air Springs shall be equal to type MT and leveling valves equal to type LV as manufactured by Mason Industries, Inc.
9. Type 9: Restrained air spring mountings shall have an MT air spring as described in Type 8, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2 inch (12 mm) shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to

resist all seismic forces. Mountings shall be equal to type SLR-MT as manufactured by Mason Industries, Inc.

10. Type 10: Hangers shall consist of rigid steel frames containing minimum 1-1/4 inch (32 mm) thick neoprene elements at the top and a steel spring with general characteristics as in Type 5 seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30-degree arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30-degree capability. Hangers shall be equal to type 30N as manufactured by Mason Industries, Inc.
    a. Type 10A: Hangers shall be as described in Type 10, but they shall be supplied with a combination rubber and steel rebound washer as the seismic upstop for suspended piping, ductwork, equipment and electrical cable trays. Rubber thickness shall be a minimum of 1/4 inch (6 mm). Submittals shall include a drawing of the hanger showing the installation of the rebound washer. Hangers shall be equal to type RW30N as manufactured by Mason Industries, Inc.
11. Type 11: Hangers shall be as described in Type 10, but they shall be precompressed and locked at the rated deflection by means of a resilient seismic upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30-degree capability. Hangers shall be equal to type PC30N as manufactured by Mason Industries, Inc.
12. Type 12: Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cables shall be pre-stretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables shall not be allowed to bend across sharp edges. Cable assemblies shall be UL listed for seismic restraint. At trapeze anchor locations piping shall be shackled to the trapeze. Cable assemblies shall be equal to type SCB at the ceiling and at the clevis bolt, equal to SCBH between the hanger rod nut and the clevis or equal to SCBV if clamped to a beam, all as manufactured by Mason Industries, Inc.
13. Type 13: Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment. Seismic solid brace assembly shall have anchorage preapproval OPA number from OSHPD in the state of California verifying the maximum certified load ratings. At trapeze anchor locations piping shall be shackled to the trapeze. Solid seismic brace assemblies shall be equal to type SSB, SSBS or SSRF as manufactured by Mason Industries, Inc.
14. Type 14: Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an Anchorage Preapproval OPA Number from OSHPD in the State of California. At trapeze anchor locations piping shall be shackled to the trapeze. Rod clamp assemblies shall be equal to type SRC or UC as manufactured by Mason Industries, Inc.
15. Type 15: Pipe clevis cross bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall be UL listed for seismic restraint. Clevis cross brace shall be equal to type CCB as manufactured by Mason Industries, Inc.
16. Type 16: All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch (6 mm) thick. Rated loadings shall not

exceed 1000 psi (70.3 kg/sq-cm). A minimum air gap of 1/8 inch (3 mm) shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated. Snubbers shall be UL listed for seismic restraint. Snubber shall be equal to type Z-1225 as manufactured by Mason Industries, Inc.

17. Type 17: All-directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications. Elastomeric materials shall be replaceable and a minimum of 3/4 inch (19 mm) thick. Rated loadings shall not exceed 1000 psi (70.3kg/sq-cm). Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8 inch (3 mm) nor more that 1/4 inch (6 mm). Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at 3/8 inch (9 mm) deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable G force. Submittals shall include the load deflection curves up to 1/2 inch (12 mm) deflection in the x, y and z planes. Snubbers shall have an anchorage preapproval OPA number from OSHPD in the state of California verifying the maximum certified horizontal and vertical load ratings. Snubbers shall be equal to type Z-1011 as manufactured by Mason Industries, Inc.
18. Type 18: Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is rolled to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud anchors shall have an evaluation report number from the ICC Evaluation Service, Inc. verifying its allowable loads. Drill-in stud wedge anchors shall be equal to type SAS as manufactured by Mason Industries, Inc.
19. Type 19: Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedge anchors shall have an evaluation report number from the ICC Evaluation Service, Inc. verifying to its allowable loads. Drill-in female wedge anchors shall be equal to type SAB as manufactured by Mason Industries, Inc.
20. Type 20: Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14 inches (350 mm) provided that deflection and misalignment are limited to values that are acceptable to the Architect Engineer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1 inch (25 mm). Bases shall be equal to type WF as manufactured by Mason Industries, Inc.
21. Type 21: Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Base depth shall be a minimum of 1/12 of the longest dimension of the base but not less than 6 inches (150 mm). The base depth need not exceed 12 inches (300 mm) unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2 inch (12 mm) bars welded in place on 6 inches (150 mm) centers running both ways in a layer 1-1/2 inches (38 mm) above the bottom. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1 inch (25 mm) clearance below the base. Wooden formed bases leaving a concrete rather than a steel finish are not acceptable. Base shall be equal to type BMK or K as manufactured by Mason Industries, Inc.
22. Type 22: Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal or structural steel sections containing

adjustable and removable steel springs that support the upper floating section. The upper frame shall provide continuous support for the equipment and shall be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of 1/4 inch (6 mm) thick. Steel springs shall be laterally stable and rest on 1/4 inch (6 mm) thick neoprene acoustical pads. Hardware shall be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous flexible flashing nailed over the lower curbs waterproofing. All spring locations shall have accessibility to adjust springs. Lower curbs shall have provision for 2 inch (50 mm) of insulation. The roof curbs shall be built to seismically contain the rooftop unit. The unit shall be solidly fastened to the top floating rail, and the lower section anchored to the roof structure. Curb shall be UL listed for seismic restraint. Curb shall be equal to type SRSC or RMSS as manufactured by Mason Industries, Inc.

23. Type 23: Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Kevlar® tire cord frictioning. Any substitutions shall have equal or superior physical and chemical characteristics. Solid steel rings shall be used within the raised face rubber flanged ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes 2 inches (50 mm) and larger shall have two spheres reinforced with a ductile iron external ring between spheres. Flanges shall be split ductile iron or steel with hooked or similar interlocks. Sizes 16 inches (400 mm) to 24 inches (600 mm) may be single sphere. Sizes 3/4 inch (19 mm) to 1-1/2 inches (38 mm) may have threaded two piece bolted flange assemblies, one sphere and cable retention. Connectors shall be rated at 250 psi (1.72 MPa) up to 170 degrees F (77 degrees C) with a uniform drop in allowable pressure to 215 psi (1.48 MPa) at 250 degrees F (121 degrees C) in sizes through 14 inches (350 mm). 16 inches (400 mm) through 24 inches (600 mm) single sphere minimum ratings are 180 psi (1.24 MPa) at 170 degrees F (77 degrees C) and 150 psi (1.03 MPa) at 250 degrees F (121 degrees C). Higher rated connectors may be used to accommodate service conditions. All expansion joints shall be factory tested to 150% of rated pressure for 12 minutes before shipment. Safety factors to burst and flange pullout shall be a minimum of 3:1. Concentric reducers to the above ratings may be substituted for equal ended expansion joints.
    a. Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods shall be used in unanchored piping locations. If control rods are used, they shall have 1/2 inch (12 mm) thick Neoprene washer bushings large enough in diameter to take the thrust at 1000 psi (70.3 kg/sq-cm) maximum on the washer area.
    b. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at actual blade passage frequencies on this project. All expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be equal to type SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as manufactured by Mason Industries, Inc.
24. Type 24: Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3 inches (75 mm) and larger shall be flanged. Smaller sizes shall have male nipples.
    a. Minimum lengths shall be as follows:
        1) Flanged:
            (a) 3 inches x 14 inches (75 by 350 mm)
            (b) 4 inches x 15 inches (100 by 375 mm)
            (c) 5 inches x 19 inches (125 by 475 mm)
            (d) 6 inches x 20 inches (150 by 500 mm)
            (e) 8 inches x 22 inches (200 by 550 mm)
            (f) 10 inches x 26 inches (250 by 650 mm)
            (g) 12 inches x 28 inches (300 by 700 mm)
            (h) 14 inches x 30 inches (350 by 750 mm)
            (i) 16 inches x 32 inches (400 by 800 mm)
        2) Male Nipples:

(a) 1/2 inch x 9 inches (12 by 225 mm)
(b) 3/4 inch x 10 inches (19 by 250 mm)
(c) 1 inch x 11 inches (25 by 275 mm)
(d) 1-1/4 inches x 12 inches (32 by 300 mm)
(e) 1-1/2 inches x 13 inches (38 by 325 mm)
(f) 2 inches x 14 inches (50 by 350 mm)
(g) 2-1/2 inches x 18 inches (64 by 450 mm)

b. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible. Hoses shall be equal to type BSS as manufactured by Mason Industries, Inc.

25. Type 25: All-directional acoustical pipe anchor shall consist of two sizes of steel tubing separated by a minimum 1/2 inch (12 mm) thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi (35.2 kg/sq-cm) and the design shall be balanced for equal resistance in any direction. All-directional anchors shall be equal to type ADA as manufactured by Mason Industries, Inc.
26. Type 26: Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2 inch (12 mm) thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of plus or minus 1-5/8 inches (41 mm) motion, or to meet location requirements. Pipe guides shall be equal to type VSG as manufactured by Mason Industries, Inc.
27. Type 27: Split Wall Seals consist of two bolted pipe halves with minimum 3/4 inch (19 mm) thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1 inch (25 mm) past either face of the wall. Where temperatures exceed 240 degrees F (115 degrees C), 10 pounds per cubic foot (160 kg/cu. m) density fiberglass may be used in lieu of the sponge. Seals shall be equal to type SWS as manufactured by Mason Industries, Inc.
28. Type 28: The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup as described in Type 5 with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4 inch (6 mm) movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the ductwork or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit. Horizontal thrust restraints shall be equal to type WBI/WBD as manufactured by Mason Industries, Inc.
29. Type 29: Housekeeping pad anchors shall consist of a ductile iron casting that is tapered and hexagonal, smaller at its base than at its top. The upper portion shall have holes for rebar to pass through. The anchor shall be continuously threaded from top to bottom for the attachment of soleplates. Housekeeping pad anchors shall be attached to the structural slab using a stud wedge anchor. Housekeeping pad anchors shall be equal to type HPA and stud wedge anchor shall be equal to type SAS both as manufactured by Mason Industries, Inc.

PART 3 EXECUTION

3.01 GENERAL

A. All vibration isolators and seismic restraint systems shall be installed in strict accordance with the manufacturer's written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic restraints shall not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. Do not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. “Building” includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the Architect Engineer's attention prior to installation. Corrective work required by conflicts after installation shall be at no additional cost to the Owner.

G. Bring to the Architect Engineer's attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work required by discrepancies after installation shall be at no additional cost to the Owner.

H. Correct all installations which are deemed defective in workmanship and materials at no additional cost to the Owner.

I. Overstressing of the building structure shall not occur because of overhead support of equipment. Contractor shall submit loads to the structural engineer of record for approval. Generally bracing may occur from:
   1. Flanges of structural beams.
   2. Panel points in bar joist construction.
   3. Cast in place inserts or wedge type drill-in concrete anchors.

J. Type 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

K. Type 12 cable assemblies are installed taut on non-isolated systems. Type 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

L. At locations where Type 12 or Type 13 restraints are located, the support rods shall be braced when necessary to accept compressive loads with Type 14 braces.

M. At locations where Type 12 cable restraints are installed on support rods with spring isolators, the spring isolation hangers shall be Type 10A.

N. At all locations where Type 12 or Type13 restraints are attached to pipe clevis's, the clevis cross bolt shall be reinforced with Type 15 braces.

O. Drill-in concrete anchors for ceiling and wall installation shall be Type 18, and Type 19 female wedge type for floor mounted equipment.

P. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.

Q. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24 inches or specified movements exceed Type 23 capabilities.

R. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide Type 27 wall seals.

S. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be Type 28.

T. Locate isolation hangers as near to the overhead support structure as possible.

U. All fire protection piping shall be braced in accordance with NFPA 13 and 14.

V. All mechanical equipment shall be vibration isolated and seismically restrained as per the schedules shown on the drawings.

W. All fire protection equipment is considered life safety equipment and shall be seismically restrained using the seismic force levels calculated for life safety equipment according to the codes and standards shown on Structural Drawings.

X. VAV boxes and fan powered equipment weighing less than 50 pounds (23 kg) and rigidly connected to the supply side of the duct system and supported with a minimum of 4 hanger rods.

3.02 VIBRATION ISOLATION OF PIPING

A. Horizontal Pipe Isolation: The first four pipe hangers in the main lines near the mechanical equipment shall be as described in Type 11. Brace hanger rods with SRC clamps Type 14. Horizontal runs in all other locations throughout the building shall be isolated by hangers as described in Type 10 & Type 10A. Floor supported piping shall rest on isolators as described in Type 6. Heat exchangers and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75 inch (19 mm) deflection for pipe sizes up to and including 3 inch (75 mm), 1-1/2 inch (38 mm) deflection for pipe sizes up to and including 6 inch (150 mm), and 2-1/2 inch (64 mm) deflection for pipes larger than 6 inch (150 mm) Hangers shall be located as close to the overhead structure as practical. Hanger locations that also have seismic restraints attached shall have type RW Rebound Washers to limit uplift. Where piping connects to mechanical equipment install Type 23 expansion joints or Type 24 stainless hoses as required for the service.

B. Riser Isolation: Risers shall be suspended from Type 10A hangers or supported by Type 5 mountings, anchored with Type 25 anchors, and guided with Type 26 sliding guides. Steel springs shall be a minimum of 0.75 inch (19 mm) except in those expansion locations where additional deflection is required to limit load changes to plus or minus 25 percent of the initial load. Submittals shall include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

C. Seismic Restraint of Piping:
   1. Seismically restrain all piping listed as a, b or c below. Use Type 12 cables if isolated. Type 12 or Type 13 restraints may be used on unisolated piping.
      a. Fuel oil piping, gas piping, medical gas piping, and compressed air piping that is 1 inch (25 mm) I.D. or larger.
      b. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1-1/4 inch (32 mm) I.D. and larger.
      c. All other piping 2-1/2-inch (64 mm) diameter and larger.
   2. Transverse piping restraints shall be at 40 feet (12 m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
   3. Longitudinal restraints shall be at 80 feet (24 m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
   4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
   5. For fuel oil and all gas piping transverse restraints shall be at 20 feet (6 m) maximum and longitudinal restraints at 40 feet (12 m) maximum spacing.
   6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24 inches (600 m) of the elbow or TEE or combined stresses are within allowable limits at longer distances.
   7. Hold down clamps shall be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.

8. Branch lines may not be used to restrain main lines.
9. Cast iron pipe of all types, glass pipe and any other pipes joined with a four band shield and clamp assembly in areas with Ss of 0.35 or greater shall be braced as in Sections 3.02.C.2 and 3.02.C.3. For areas with Ss less than 0.35, 2 band clamps may be used with a reduced spacing of 1/2 of those listed in sections 3.02.C.2 and 3.02.C.3.
10. Connection to the structure shall be made with a non-friction connection (i.e. no C-clamps).
11. Hanger locations that also have seismic restraints attached shall have Type 10A RW Rebound Washers.

D. Pipe Exclusions:
1. Gas piping less than 1 inch (25 mm) inside diameter.
2. Piping in boiler and mechanical rooms less than 1-1/4 inch (32 mm) inside diameter.
3. All other piping less than 2-1/2 inch (64 mm) inside diameter.
4. Certain suspended piping:
   a. All piping suspended by clevis hangers where the distance from the top of the pipe to the suspension point is 12 inches or less.
   b. All trapeze supported piping where the distance from the suspension point to the trapeze member is 12-inch or less.
   c. If any suspension location in the run fails to qualify under (a) or (b) above, the entire run shall be braced.

3.03 VIBRATION ISOLATION AND SEISMIC RESTRAINT OF DUCTWORK

A. Vibration isolation of ductwork:
1. All discharge runs for a distance of 50 feet (15m) from the connected equipment shall be isolated from the building structure by means of Type 10 hangers or Type 5 floor isolators. Spring deflection shall be a minimum of 0.75 inch (19 mm).
2. All duct runs having air velocity of 1000 fpm (5 m/s) or more shall be isolated from the building structure by Type 11 hangers or 5 floor supports. Spring deflection shall be a minimum of 0.75 inch (19 mm).

B. Seismic restraint of ductwork:
1. Seismically restrain all ductwork with Type 12 or Type 13 restraints as listed below:
   a. Restrain rectangular ducts with cross sectional area of 6 sq. ft. (0.5 sq m) or larger.
   b. Restrain round ducts with diameters of 28 inches (700 mm) or larger.
   c. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
2. Transverse restraints shall occur at 30 feet (9 mm) intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
3. Longitudinal restraints shall occur at 60 feet (18 m) intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4 feet (1.2 m) of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
4. The ductwork shall be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
5. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
6. Walls, including gypsum board non bearing partitions, which have ducts running through them may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.
7. Connection to the structure shall be made with a non-friction connection (i.e. no C-clamps)
8. Hanger locations that also have seismic restraints attached shall have Type 10A RW Rebound Washers.

C. Ductwork Exclusions:
   1. Rectangular and square and ducts that are less than 6 square feet in cross sectional area.
   2. Oval ducts that are less than 6 square feet (0.5 sq m) in cross sectional area based on nominal size.
   3. Round duct less than 28-inch (0.71 m) diameter.
   4. Certain suspended ductwork
      a. All trapeze supported ductwork where the distance from the suspension point to the trapeze member is 12-inches or less.
      b. Ductwork hung with straps where the top of the duct is 12-inches or less from the suspension point and the strap has 2 #10 sheet metal screws within 2-inch of the top of the duct.
      c. If any suspension location in the run fails to qualify under (a) or (b) above, the entire run shall be braced.

3.04 ELECTRICAL SERVICES

A. Seismic Restraint:
   1. All electrical conduit 2-1/2-inch (64 mm) in diameter and larger shall be restrained with Type 12 seismic cable restraints or Type 13 for seismic solid brace restraints.
   2. All electrical bus ducts, cable trays and ladder trays shall be restrained with Type 12, seismic cable restraints or Type 13 seismic solid brace restraints.
   3. Transverse restraints shall occur at 30 feet (9 m) intervals or both ends if the electrical run is less than the specified interval. Transverse restraints shall be installed at each electrical services turn and at each end of the electric run.
   4. Longitudinal restraints shall occur at 60 feet (18 m) intervals with at least one restraint per electric run. Transverse restraints for one electric section may also act as a longitudinal restraint for a duct for an electric section connected perpendicular to it if the restraints are installed within 4 feet (1.2 m) of the intersection of the electric run and if the restraints are sized for the larger electric run.
   5. All floor mounted transformers, motor starters, switchgears and substations shall have a resilient media between the equipment mounting hole and the anchor bolt. Anchor bolts shall be designed in accordance with seismic forces shown on Structural Drawings. Neoprene bushings shall be Type 4 and anchor bolts shall be Type 18 or Type 19.
   6. Wall mounted panels, transformers and motor starters shall be mounted with Type 3 bushings. Floor mounted panels shall be mounted on Type 4 bushings. Anchor bolts shall be Type 18 or Type 19.
   7. All generators shall be mounted on a Type 21 concrete inertia base, with Type 5 spring isolators and Type 17 seismic snubbers.
   8. Connection to the structure shall be made with a non-friction connection (i.e. no C-clamps)

B. Exclusions:
   1. All conduit less than 2-1/2 inches (64 mm) diameter suspended by individual hanger rods.
   2. Certain Suspended Conduit:
      a. All conduits suspended by clevis hangers where the distance from the top of the conduit to the suspension point is 12 inches (300 mm) or less.
      b. All trapeze supported conduits, bus ducts and cable trays where the distance from the suspension point to the trapeze member is 12 inches (300 mm) or less.
      c. If any suspension location in the run fails to qualify under (a) or (b) above, the entire run shall be braced.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Commissioning activities.

1.03 RELATED REQUIREMENTS

A. Section 01 21 00 - Allowances: Inspection and testing allowances.

B. Section 01 40 00 - Quality Requirements: Employment of testing agency and payment for services.

1.04 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; 2002.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect Engineer.
   2. Submit to the Commissioning Authority.
   3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   4. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect Engineer and other installers to sufficiently understand the design intent for each system.
   5. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Expected problems and solutions, etc.
      f. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Submit to the the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.

2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect Engineer and for inclusion in operating and maintenance manuals.
4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
7. Include the following on the title page of each report:
   a. Name of Testing, Adjusting, and Balancing Agency.
   b. Address of Testing, Adjusting, and Balancing Agency.
   c. Telephone number of Testing, Adjusting, and Balancing Agency.
   d. Project name.
   e. Project location.
   f. Project Contractor.
   g. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC MN-1, AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
   4. SMACNA (TAB).
   5. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.

6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect Engineer to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on the drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Forced Air Furnaces.
   2. Direct Fired Furnaces.
   3. Air Cooled Refrigerant Condensers.
   4. Packaged Roof Top Heating/Cooling Units.
   5. Air Coils.
   6. Terminal Heat Transfer Units.
   7. Fans.
   8. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.
   6. Service factor.
   7. Starter size, rating, heater elements.
   8. Sheave Make/Size/Bore.

B. V-Belt Drives:
   1. Identification/location.
   2. Required driven RPM.
   3. Driven sheave, diameter and RPM.
   4. Belt, size and quantity.
   5. Motor sheave diameter and RPM.
   6. Center to center distance, maximum, minimum, and actual.

C. Air Cooled Condensers:
   1. Identification/number.
   2. Location.
   3. Manufacturer.
   4. Model number.
   5. Serial number.
   6. Entering DB air temperature, design and actual.
   7. Leaving DB air temperature, design and actual.
   8. Number of compressors.

D. Heat Exchangers:
   1. Identification/number.
   2. Location.
   3. Service.
   4. Manufacturer.
   5. Model number.
   6. Serial number.

E. Cooling Coils:
   1. Identification/number.
   2. Location.
   3. Service.
   4. Manufacturer.
   5. Air flow, design and actual.
   6. Entering air DB temperature, design and actual.
   7. Entering air WB temperature, design and actual.
   8. Leaving air DB temperature, design and actual.
   9. Leaving air WB temperature, design and actual.
   10. Saturated suction temperature, design and actual.
   11. Air pressure drop, design and actual.

F. Electric Duct Heaters:
   1. Manufacturer.
   2. Identification/number.
   3. Location.
   4. Model number.
   5. Design kW.
   6. Number of stages.
   7. Phase, voltage, amperage.
   8. Test voltage (each phase).
   9. Test amperage (each phase).
   10. Air flow, specified and actual.
   11. Temperature rise, specified and actual.

G. Air Moving Equipment:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Arrangement/Class/Discharge.
   6. Air flow, specified and actual.
   7. Return air flow, specified and actual.
   8. Outside air flow, specified and actual.
   9. Total static pressure (total external), specified and actual.
   10. Inlet pressure.
   11. Discharge pressure.
   12. Sheave Make/Size/Bore.
   13. Number of Belts/Make/Size.
   14. Fan RPM.

H. Return Air/Outside Air:
   1. Identification/location.
   2. Design air flow.
   3. Actual air flow.
   4. Design return air flow.
   5. Actual return air flow.
   6. Design outside air flow.
   7. Actual outside air flow.
   8. Return air temperature.
   9. Outside air temperature.
   10. Required mixed air temperature.
   11. Actual mixed air temperature.
   12. Design outside/return air ratio.
   13. Actual outside/return air ratio.

I. Exhaust Fans:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Air flow, specified and actual.
   6. Total static pressure (total external), specified and actual.
   7. Inlet pressure.
   8. Discharge pressure.
   9. Sheave Make/Size/Bore.
   10. Number of Belts/Make/Size.
   11. Fan RPM.

J. Duct Traverses:
   1. System zone/branch.
   2. Duct size.
   3. Area.
   4. Design velocity.
   5. Design air flow.
   6. Test velocity.
   7. Test air flow.
   8. Duct static pressure.
   9. Air temperature.
   10. Air correction factor.

END OF SECTION

SECTION 23 07 13
DUCT INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Duct insulation.

B. Duct Liner.

C. Insulation jackets.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 84 00 - Firestopping.

C. Section 09 91 23 - Interior Painting: Painting insulation jackets.

D. Section 23 31 00 - HVAC Ducts and Casings: Glass fiber ducts.

1.04 REFERENCE STANDARDS

A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2014.

C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

F. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

G. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2012.

H. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2011.

I. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

K. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

L. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

M. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

N. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Samples: Submit two samples of any representative size illustrating each insulation type.

D. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Outdoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

2.03 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible blanket.
   1. 'K' Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 450 degrees F.
   3. Maximum Water Vapor Absorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure sensitive tape.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.

2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETS

A. Exterior insulation jackets for outside applications shall be a multi-ply embossed UV-resistant aluminum foil/polymer laminate with a layer of rubberized asphalt specially fomulated for use on insulated duct. The jacket willl include a metalized polyester film coated with a high quality low temperature acrylic adhesive that allows for a peel and stick functionality.

B. Aluminum (Indoor) Jacket: ASTM B209 (ASTM B209M).
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.05 DUCT LINER

A. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
1. Fungal Resistance: No growth when tested according to ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
3. Service Temperature: Up to 250 degrees F.
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
5. Minimum Noise Reduction Coefficients:
a. 1/2 inch Thickness: 0.30.
b. 1 inch Thickness: 0.45.
c. 1-1/2 inches Thickness: 0.60.
d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type, ASTM C916.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket finished as specified in Section _____.

F. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
2. Secure insulation without vapor barrier with staples, tape, or wires.
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

G. Duct and Plenum Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 SCHEDULES

A. Supply Ducts: 2"

B. Supply Ducts From Fans to Vertical Ducts in Shafts (Cooling System): 2"

C. Supply Ducts in Vertical Shafts (Cooling Systems): 2"

D. Supply ducts After Terminal Boxes: 2"

E. Return and Relief Ducts in Mechanical Rooms: 2"

F. Ducts Exposed to Outdoors: 2"

END OF SECTION

SECTION 23 07 19
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.03 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 84 00 - Firestopping.

C. Section 09 91 23 - Interior Painting: Painting insulation jacket.

D. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts.

E. Section 23 21 13 - Hydronic Piping: Placement of hangers and hanger inserts.

F. Section 23 22 13 - Steam and Condensate Heating Piping: Placement of hangers and hanger inserts.

G. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

1.04 REFERENCE STANDARDS

A. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2013).

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2014.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

D. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.08 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
   1. Maximum Service Temperature: 650 degrees F.
   2. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

G. Fibrous Glass Fabric:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Blanket: 1.0 lb/cu ft density.
   3. Weave: 5x5.

H. Indoor Vapor Barrier Finish:
   1. Cloth: Untreated; 9 oz/sq yd weight.
   2. Vinyl emulsion type acrylic, compatible with insulation, black color.

I. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

K. Insulating Cement: ASTM C449.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Aeroflex USA, Inc; _____: www.aeroflexusa.com.
   2. Armacell LLC; _____: www.armacell.us.
   3. K-Flex USA LLC; _____: www.kflexusa.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
   3. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.

c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
d. Thickness: 10 mil.
e. Connections: Brush on welding adhesive.

2. Covering Adhesive Mastic: Compatible with insulation.

B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
a. Minimum Service Temperature: Minus 40 degrees F.
b. Maximum Service Temperature: 180 degrees F.
c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
d. Thickness: 30 mil.
e. Connections: Brush on welding adhesive.

C. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Glass fiber insulated pipes conveying fluids below ambient temperature:
1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.

F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

3.03 SCHEDULE

A. Cooling Systems:
1. Chilled Water: 1"
2. Refrigerant Suction: 1"

3. Refrigerant Hot Gas: 1"

END OF SECTION

SECTION 23 23 00
REFRIGERANT PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Check valves.
G. Pressure regulators.
H. Pressure relief valves.
I. Filter-driers.
J. Solenoid valves.
K. Expansion valves.
L. Receivers.
M. Flexible connections.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.
B. Section 08 31 00 - Access Doors and Panels.
C. Section 09 91 23 - Interior Painting.
D. Section 23 07 19 - HVAC Piping Insulation.
E. Section 23 63 13 - Air Cooled Refrigerant Condensers.
F. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
B. AHRI 750 - Standard for Thermostatic Refrigerant Expansion Valves; 2007.
C. AHRI 760 - Standard for Performance Rating of Solenoid Valves for Use With Volatile Refrigerants; 2007.
D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.
E. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.
F. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.
G. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
H. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2013.
I. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2013.
J. ASME B31.9 - Building Services Piping; 2014.
K. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

L. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.

N. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2013.

O. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

Q. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.05 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:
1. Use line size liquid indicators in main liquid line leaving condenser.
2. If receiver is provided, install in liquid line leaving receiver.
3. Use line size on leaving side of liquid solenoid valves.

D. Valves:
1. Use service valves on suction and discharge of compressors.
2. Use gage taps at compressor inlet and outlet.
3. Use gage taps at hot gas bypass regulators, inlet and outlet.
4. Use check valves on compressor discharge.
5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:
1. Use line size strainer upstream of each automatic valve.
2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
3. On steel piping systems, use strainer in suction line.
4. Use shut-off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
2. Use a filter-drier on suction line just ahead of compressor.
3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
4. Use sealed filter-driers in low temperature systems.
5. Use sealed filter-driers in systems utilizing hermetic compressors.
6. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
7. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
8. Use filter-driers for each solenoid valve.

I. Solenoid Valves:
1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

J. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

C. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

D. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

E. Test Reports: Indicate results of leak test, acid test.

F. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

G. Submit welders certification of compliance with ASME BPVC-IX.

H. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

I. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Filter-Dryer Cartridges: One of each type and size.
   3. Refrigeration Oil Test Kits: One, each containing everything required to conduct one test.
   4. Extra Refrigerant: One container of refrigerant, _____ pounds size.

1.07 QUALITY ASSURANCE

A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum _____ years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Copper Tube to 7/8 inch OD: ASTM B88 (ASTM B88M), Type K (A), annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

C. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.
      a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
5. Vertical Support: Steel riser clamp.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
9. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
   a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
   b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.

2.02 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.03 VALVES

A. Diaphragm Packless Valves:
   1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

B. Packed Angle Valves:
   1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.

C. Ball Valves:
   1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

D. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi.

2.04 STRAINERS

A. Straight Line or Angle Line Type:
   1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

B. Straight Line, Non-Cleanable Type:
   1. Steel shell, copper plated fittings, stainless steel wire screen, for maximum working pressure of 125 psi.

2.05 CHECK VALVES

A. Globe Type:

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.

B. Straight Through Type:
1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi and maximum temperature of 200 degrees F.

2.06 PRESSURE REGULATORS

A. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi range, for maximum working pressure of 450 psi.

2.07 PRESSURE RELIEF VALVES

A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi.

2.08 FILTER-DRIERS

A. Performance:
1. Pressure Drop: 2 psi, maximum, when operating at full connected evaporator capacity.
2. Design Working Pressure: 350 psi, minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
1. Replaceable Core Type: Steel shell with removable cap.
2. Sealed Type: Copper shell.
3. Connections: As specified for applicable pipe type.

2.09 SOLENOID VALVES

A. Valve: AHRI 760 I-P, pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, solder, or threaded ends; for maximum working pressure of 500 psi.

B. Coil Assembly: UL 429, UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.10 EXPANSION VALVES

A. Angle or Straight Through Type: AHRI 750; design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with non-replaceable capillary tube and remote sensing bulb and remote bulb well.

B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.11 ELECTRONIC EXPANSION VALVES

A. Valve:
1. Brass body with flared or solder connection, needle valve with floating needle and machined seat, stepper motor drive.

B. Evaporation Control System:
1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, preselection allowance for electrical defrost and hot gas bypass.

C. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

2.12 RECEIVERS

A. Internal Diameter 6 inch and Smaller:
   1. AHRI 495, UL listed, steel, brazed; 400 psi maximum pressure rating, with tappings for inlet, outlet, and pressure relief valve.

B. Internal Diameter Over 6 inch:
   1. AHRI 495, welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; 400 psi with tappings for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

2.13 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.

F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 31 00.

I. Flood piping system with nitrogen when brazing.

J. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

K. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 91 23.

L. Insulate piping and equipment; refer to Section and Section 22 07 16.

M. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

N. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

O. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

P. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

Q. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

R. Fully charge completed system with refrigerant after testing.

S. Provide electrical connection to solenoid valves. Refer to Section 26 27 17.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.

C. Pressure test system with dry nitrogen to 200 psi. Perform final tests at 27 inches vacuum and 200 psi using halide torch. Test to no leakage.

3.04 SCHEDULES

A. Hanger Spacing for Copper Tubing.
1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
6. 2-5/8 inch OD: Maximum span, 9 feet; minimum rod size, 3/8 inch.
7. 3-1/8 inch OD: Maximum span, 10 feet; minimum rod size, 3/8 inch.
8. 3-5/8 inch OD: Maximum span, 11 feet; minimum rod size, 1/2 inch.
9. 4-1/8 inch OD: Maximum span, 12 feet; minimum rod size, 1/2 inch.

END OF SECTION

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SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

C. Casing and plenums.

D. Kitchen hood ductwork.

E. Fabric Duct

1.03 RELATED REQUIREMENTS

A. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

B. Section 23 33 00 - Air Duct Accessories.

C. Section 23 36 00 - Air Terminal Units.

D. Section 23 37 00 - Air Outlets and Inlets.

1.04 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2013.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

D. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

F. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for duct materials.

C. Manufacturer's Installation Instructions: Indicate special procedures for glass fiber ducts.

D. Manufacturer's Certificate: Certify that installation of glass fiber ductwork meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.

1.07 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A standards.

1.08 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.

D. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. pressure class, galvanized steel.

E. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel.

F. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel.

G. Kitchen Cooking Hood Exhaust: 1/2 inch w.g. pressure class, stainless steel.
   1. Construct of 18 gage, 0.0500 inch stainless steel using continuous external welded joints in rectangular sections.

H. Dishwasher Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
   1. Construct of 16 gage, 0.0598 inch sheet steel using continuous external welded joints in rectangular sections.
   2. Construct of 18 gage, 0.0500 inch stainless steel using continuous external welded joints in rectangular sections.

I. Biology Class Fume Hood Exhaust: 1/2 inch w.g. pressure class, galvanized steel.

J. Outside Air Intake: 1/2 inch w.g. pressure class, galvanized steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
   1. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
   2. Maximum Velocity: 4000 fpm.
   3. Temperature Range: Minus 10 degrees F to 160 degrees F.

B. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

C. Kitchen Cooking Hood and Grease Exhaust: Nominal 3 inches thick ceramic fiber insulation between 20 gage, 0.0375 inch, Type 304 stainless steel liner and 24 gage, 0.0239 inch aluminized steel sheet outer jacket.
   1. Tested and UL listed for use with commercial cooking equipment in accordance with NFPA 96.
   2. Certified for zero clearance to combustible material in accordance with:
   3. Materials and construction of the modular sections and accessories to be in accordance with the terms of the following listings:

D. Dishwasher Exhaust: Minimum 21 gage, 0.0344 inch thick, single wall, Type 304 stainless steel.

1. Single wall, factory built chimney liner system.
2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.

E. Fume Hood Exhaust: Minimum 21 gage, 0.0344 inch thick, single wall, Type 304 stainless steel.
1. Single wall, factory built chimney liner system.
2. Designed, fabricated, and installed to be liquid tight preventing exhaust leakage into the building.
3. Joints to be sealed during installation with factory supplied overlapping V-bands and sealant.

2.05 CASINGS

A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gage, 0.0478 inch expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

2.06 KITCHEN HOOD EXHAUST DUCTWORK

A. Fabricate in accordance with ductwork manufacturer's installation instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.

2.07 FABRIC DUCT

A. Fabric Tensioning System: Air diffusers shall be constructed with internal tensioning frame.
1. System shall be cylindrically tension textile along the entire length of textile duct, including all fittings (crosses, elbows, reducers and tees).
2. Tensioning system shall include full 360 degree tensioning and intermediate rings with quick connection spacer tubes concealed inside fabric system.
3. Interior structure to include multiple mechanically adjustable tension devices. To provide proper textile tensioning, structural and textile system shall be configured in segements of no more than 45 feet.
4. Textile components supported soley by metal cylindrical rings.
5. Each cylindrical ring shall require a vertical metal to metal cable safety attachement.
   a. Vertical supports are Galvanized steel with available lengths of 5' (standard).

B. Textile Construction: Filament/filament twill polyester, fire retardant in accordance with UL 2518.
1. Air Permeability: 2 (+2/-1) CFM/ft2 per ASTM D737, Frazier.
2. Weight: 6.8 oz. /yd2 per ASTM D3776.

C. Orifices - 2" @ 3" SG's (Sewn-in Grommets)
1. Air dispersion and extended throws are accomplished by reinforced orifices and permeable fabric. Reinforced orifices are to be installed to keep the integrity of the opening and withstand laundry processes.
2. Diameter, quantity, and location of reinforced orifices to be specified and approved by manufacturer.

D. Manufacturer: Duct Sox or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Kitchen Hood Exhaust: Provide residue traps at base of vertical risers with provisions for clean out.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

H. Use double nuts and lock washers on threaded rod supports.

I. Connect terminal units to supply ducts directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.

J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

K. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.

L. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

END OF SECTION

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Duct access doors.

C. Duct test holes.

D. Flexible duct connections.

E. Volume control dampers.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

C. Section 23 31 00 - HVAC Ducts and Casings.

D. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.

C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2015.

D. NFPA 96 - Standard Ventilation Control and Fire Protection of Commercial Cooking Operations; 2014.

E. NFPA 105 - Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives; 2013

F. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

C. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.02 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Access doors with sheet metal screw fasteners are not acceptable.

2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

D. Maximum Installed Length: 14 inch.

2.05 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:
   1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
   2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
   3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .

C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
   1. Fabricate for duct sizes up to 6 x 30 inch.
   2. Blade: 24 gage, 0.0239 inch, minimum.

D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96. Provide minimum 8 x 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 22 05 48.

G. For fans developing static pressures of 5.0 inches and over, cover flexible connections with leaded vinyl sheet, held in place with metal straps.

H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

I. Use splitter dampers only where indicated.

J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

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SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Diffusers.

B. Registers/grilles.

1.03 REFERENCE STANDARDS

A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2012.

B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006 (R2011).

C. SMACNA (DCS) - HVAC Duct Construction Standards; 2005.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.05 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. American Louver Company; ALC Grilles and Registers: www.americanlouver.com.

B. Price Industries; _____: www.price-hvac.com.

C. Titus; _____: www.titus-hvac.com.

D. Tuttle and Bailey; _____: www.tuttleandbailey.com/sle.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DIFFUSERS AND GRILLES

A. Refer to the drawings for description.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 90 00.

END OF SECTION

SECTION 23 62 13

PACKAGE ROOF TOP AIR CONDITIONING UNITS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Condensing unit package.

B. Charge of refrigerant and oil.

C. Controls and control connections.

D. Refrigerant piping connections.

E. Motor starters.

F. Electrical power connections.

1.03 RELATED REQUIREMENTS

A. Section 22 05 13 - Common Motor Requirements for Plumbing Equipment.

B. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Placement of vibration isolators.

C. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

D. Section 23 23 00 - Refrigerant Piping.

E. Section 23 09 93 - Sequence of Operations for HVAC Controls.

F. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.04 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013 (ANSI/ASHRAE Std 15).

C. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2010.

D. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013 (ANSI/ASHRAE/IESNA Std 90).

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2014.

F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2011.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. Include equipment served by condensing units in submittal, or submit at same time, to ensure capacities are complementary.

C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.

D. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

E. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, controls, and accessories.

F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Lubricating Oil: One complete change.

1.06 QUALITY ASSURANCE

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigerant compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Daikin; _____: www.daikinapplied.com.

B. Trane, a brand of Ingersoll Rand; _____: www.trane.com.

C. York International Corporation/Johnson Controls, Inc; _____: www.york.com.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MANUFACTURED UNITS

A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral sub-cooling coil, controls, liquid receiver, wind deflector, and screens.

B. Construction and Ratings: In accordance with AHRI 210/240. Test in accordance with ASHRAE Std 23.

C. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1.

2.03 CASING

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

C. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

D. Provide removable access doors or panels with quick fasteners and piano hinges.

E. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.

F. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.

G. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the

insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.

H. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.

I. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.

J. Access to filters, dampers, cooling coils, reheat coil, heaters, exhaust fans, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.

K. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

L. Units with cooling coils shall include double sloped 304 stainless steel drain pans.

M. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.

N. Unit shall include lifting lugs on the top of the unit.

O. Unit base pan shall be provided with 1/2 inch thick foam insulation.

2.04 EVAPORATOR COILS

A. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and galvanized steel end casings. Fin design shall be sine wave rippled.

2.05 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of nitrogen.

B. Coil Guard: Expanded metal .

2.06 FANS AND MOTORS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built in current and thermal overload protection. Refer to Section 23 05 13.

C. Variable speed supply fan motor using electronically commutated motors. Variable frequency drives shall be factory wired and mounted in the unit. Fan motors shall be premium efficiency.

2.07 COMPRESSORS

A. Compressor: Semi-hermetic reciprocating type.

B. Mounting: Statically and dynamically balance rotating parts and mount on rubber-in-shear vibration isolators. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged compressor access doors shall be fabricated of double wall, rigid polyurethane foam injected panels to prevent the transmission of noise outside the cabinet. Refer to Section 22 05 48.

C. Lubrication System: Reversible, positive displacement oil pump with oil charging valve, oil level sight glass, and magnetic plug or strainer.

D. Motor: Constant speed 1800 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting. Refer to Section 22 05 13. Furnish with starter.

E. Capacity Reduction Equipment: Suction valve unloaders, with lifting mechanism operated by electrically actuated solenoid valve, with unloaded compressor start; controlled from suction pressure.

F. Sump Oil Heater: Evaporates refrigerant returning to sump during shut down. Energize heater continuously when compressor is not operating.

2.08 GAS HEATING SECTION

A. Stainless steel heat exchanger furnace shall carry a 25 year non-prorated warranty, from the date of original equipment shipment from the factory.

B. Gas furnace shall consist of stainless steel heat exchangers with multiple concavities, an induced draft blower and an electronic pressure switch to lockout the gas valve until the combustion chamber is purged and combustion airflow is established.

C. Furnace shall include a gas ignition system consisting of an electronic igniter to a pilot system, which will be continuous when the heater is operating, but will shut off the pilot when heating is not required.

D. Unit shall include a single gas connection and have gas supply piping entrances in the unit base for through-the-curb gas piping and in the outside cabinet wall for across the roof gas piping.

E. Natural gas furnace shall be equipped with modulating gas valves, adjustable speed combustion blowers, stainless steel tubular heat exchangers, and electronic controller. Combustion blowers and gas valves shall be capable of modulation. Electronic controller includes a factory wired, field installed supply air temperature sensor. Sensor shall be field installed in the supply air ductwork. Supply air temperature setpoint shall be adjustable on the electronic controller within the controls compartment. 90 MBH, 150 MBH, 195 MBH, 210 MBH, 270 MBH, 292.5 MBH, 390 MBH, 540 MBH and 800MBH gas heating assemblies shall be capable of operating at any firing rate between 100% and 30% of their rated capacity. 405 MBH and 810 MBH gas heating assemblies shall be capable of operating at any firing rate between 100% and 20% of their rated capacity. 1080 MBH and 1600 MBH gas heating assembly shall be capable of operating at any firing rate between 100% and 15% of its rated capacity. 2400 MBH gas heating assembly shall be capable of operating at any firing rate between 100% and 10% of its rated capacity.

2.09 REFRIGERANT CIRCUIT

A. Provide each unit with one refrigerant circuit, factory supplied and piped. Refer to Section 23 23 00.

B. For each refrigerant circuit, provide:
1. Filter dryer replaceable core type.
2. Liquid line sight glass and moisture indicator.
3. Thermal expansion valve for maximum operating pressure.
4. Insulated suction line.
5. Suction and liquid line service valves and gage ports.
6. Liquid line solenoid valve.
7. Charging valve.
8. Discharge line check valve.
9. Compressor discharge service valve.
10. Condenser pressure relief valve.

C. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

2.10 FILTERS

A. Unit shall include 2 inch thick, pleated panel filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the cooling coil.

B. Unit shall include a clogged filter switch.

C. Units shall include a Magnehelic gauge mounted in the controls compartment.

2.11 OUTSIDE AIR/ECONOMIZER

A. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 15 cfm of leakage per sq. ft. of damper area when subjected to 2 inches w.g. air pressure differential across the damper. Damper assembly shall be controlled by spring return actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.

2.12 CONTROLS

2.13

A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, molded case disconnect switch, factory wired with single point power connection. Factory mount disconnect switch on unit under provisions of Section 26 27 17.

B. For each compressor, provide across-the-line starter, non-recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.

C. Provide safety controls arranged so any one will shut down machine:
   1. High discharge pressure switch (manual reset) for each compressor.
   2. Low suction pressure switch (automatic reset) for each compressor.
   3. Oil Pressure switch (manual reset).

D. Variable Speed Drive Fan
   1. The supply fan shall have the capability of variable speed to be used to slow the fan in the cooling mode as the space nears room temperature setpoint in an effort to maximize dehumidification.

E. Provide the following operating controls:
   1. Refer to Section 23 09 93.
   2. Thermostat located in room cycles compressors activates cylinder unloaders.
   3. One minute off timer prevents compressor from short cycling.
   4. Periodic pump-out timer to pump down on high evaporator refrigerant pressure.
   5. Low ambient temperature controls.
   6. Hot gas bypass sized for minimum compressor loading on one compressor only, bypasses hot refrigerant gas to evaporator.
   7. Lead-lag switch to alternate compressor operation.
   8. Low ambient thermostat to lock out compressor at low ambient temperatures.

F. Provide controls to permit operation down to 0 degrees F ambient temperature.
   1. Thermostat to cycle fan motors in response to outdoor ambient temperature.
   2. Head pressure switch to cycle fan motors in response to refrigerant condensing pressure.
   3. Solid state control to vary speed of one condenser fan motor in response to refrigerant condensing pressure.
   4. Electronic control consisting of mixing damper assembly, controlled to maintain constant refrigerant condensing pressure.

G. Gages: Prepiped for suction and discharge refrigerant pressures and oil pressure for each compressor.

H. For multiple units, provide remote mounted sequence panel to allow operation with lead-lag switching and time delay timer.

I. Provide low voltage, adjustable thermostat to control heating stages in sequence with delay between stages, compressor stages, and supply fan to maintain temperature setting:
   1. Include:
      a. System selector switch (heat-off-cool).
      b. Fan control switch (auto-on).
   2. Provide double acting thermostat with minimum 2 stage heating and 1 stage cooling.
   3. Locate thermostat in room as shown.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

C. Provide for connection to electrical service. Refer to Section 26 27 17.

D. Install units on vibration isolation. Refer to Section 22 05 48.

E. Provide connection to refrigeration piping system and evaporators. Refer to Section 23 23 00. Comply with ASHRAE Std 15.

3.02 SYSTEM STARTUP

A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.

B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.

C. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

D. Provide cooling season start-up, and winter season shut-down for first year of operation.

E. Inspect and test for refrigerant leaks every 120 days during first year of operation.

END OF SECTION

SECTION 23 81 19
SELF-CONTAINED AIR-CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall-mount packaged terminal air conditioning units.

B. Controls.

1.02 RELATED REQUIREMENTS

A. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ANSI/ASHRAE/IESNA 90.1-2010

B. ANSI/ARI Standard 390-2003 for SPVU (Single Package Vertical Units)

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

C. Provide a ten year warranty to include coverate for the heat exchanger.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bard; www.bardhvac.com

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, wall mounted air cooled air conditioning units, with outdoor cabinet, electric refrigeration system, gas fired heating, indoor supply & return grilles, built-in temperature controls; fully charged with refrigerant and filled with oil.

B. Electrical Characteristics:
   1. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 27 17.

2.03 CABINET

A. Discharge Grille and Access Door: Removable punched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

2.04 CHASSIS

A. Refrigeration System:
   1. Direct expansion cooling coil.
   2. Scroll compressor.
      a. Built-in off -delay timer adjustable from 30 seconds to 5 minutes. 2-minute on-delay if power is interrupt. 120-second bypass for low pressure control, and both soft and manual lockouts for high and low pressire controls. Alarm output for alarm relay.
      b. Protection against reverse rotation if power supply is not properly connected.

3. Liquid line filter drier.

B. Air System: Multispeed twin blowers _____ with permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.

C. Heating Coil: Gas Heat Exchanger.
1. Heavy duty 18-gauge stainless steel tubular heat exchanger.
2. Honeywell gas valve and burner orifices.

D. Condensate Drain: Drain pan to direct condensate to condenser coil for re-evaporation.

E. Air Filters: 2" pleated; MERV 8.

F. Energy Recovery Ventilator
1. Heat transfer efficiency 75% summer; 80% winter.

2.05 CONTROLS

A. Control Module: Unit mounted adjustable thermostat with heat anticipator, heat-off-cool switch, high-low fan switch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

END OF SECTION

SECTION 23 81 27
SMALL SPLIT-SYSTEM HEATING AND COOLING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Air-source heat pumps.

B. Forced air furnaces.

C. Air cooled condensing units.

D. Indoor air handler (fan & coil) units for duct connection.

E. Indoor ductless fan & coil units.

F. Electronic air cleaners.

G. Controls.

1.03 RELATED REQUIREMENTS

A. Section 23 31 00 - HVAC Ducts and Casings.

1.04 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; Air-Conditioning, Heating, and Refrigeration Institute; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2013 (ANSI/ASHRAE Std 15).

D. ASHRAE Std 23.1 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Temperatures of the Refrigerant; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2010.

E. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2012.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2012.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2012.

H. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; National Fire Protection Association; 2013.

I. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Filters: One for each unit.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturers warranty for electronic air cleaners.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carrier Corporation; _____: www.carrier.com.

B. Trane Inc; _____: www.trane.com.

C. York International Corporation / Johnson Controls; _____: www.york.com.

D. Daikin: www.daikinapplied.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Upflow.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 1 inch thick urethane, washable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.04 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
   1. Cabinet: Galvanized steel.
      a. Finish: White.

2. Fan: Line-flow fan direct driven by a single motor.
3. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
4. Wall-Mounted Units:

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
2. Manufacturer: System manufacturer.

C. Remote Actuators:

2.05 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Comply with AHRI 210.
2. Refrigerant: R-410A.
3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Compressor: AHRI 520; hermetic, two speed 1800 and 3600 rpm, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Coil: Air-cooled, aluminum fins bonded to copper tubes.

D. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
1. Provide thermostatic expansion valves.

E. Operating Controls:
1. Control by room thermostat to maintain room temperature setting.
2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig and off when pressure drops below 140 psig for operation to 0 degrees F.

F. Mounting Pad: Precast concrete parking bumpers, minimum 4 inches square; minimum of two located under cabinet feet.

2.06 GAS FURNACE COMPONENTS

A. Heat Exchanger: Aluminized steel ceramic coated clamshell type welded construction.

B. Burner: Atmospheric type with adjustable combustion air supply,
1. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
2. Electronic pilot ignition, with electric spark igniter.
3. Combustion air damper with synchronous spring return damper motor.
4. Non-corrosive combustion air blower with permanently lubricated motor.

C. Burner Safety Controls:
1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
2. Flame Rollout Switch: Installed on burner box and prevents operation.
3. Vent Safety Shutoff Sensor: Temperature sensor installed on draft hood and prevents operation, manual reset.
4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

D. Operating Controls:

1. Cycle burner by room thermostat to maintain room temperature setting.
2. Supply fan energized from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation.

E. Flue Termination: Standard roof kit.

2.07 ACCESSORY EQUIPMENT

A. Air Cleaners (Furnaces ONLY): Provide electrostatic filter equal to Dynamic Air Cleaner with 1" polarized media.

B.

C. Room Thermostat (Ductless Splits): Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from setpoint.

D. **Room Thermostat (Furnaces): Wall-mounted with touchscreen display.**
1. **Provide remote access through Smartphone, Tablet or Computer when connected to Wi-Fi.**
2. **Controls up to 2 Heat / 2 Cooling conventional systems.**
3. **Manufacturer: Honeywell: Wi-Fi VisionPRO 8000**
   a. Thermostat display:
      1) Actual room temperature.
      2) System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install gas fired furnaces in accordance with NFPA 54.

D. Provide vent connections in accordance with NFPA 211.

E. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

SECTION 26 00 10
ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 WORK INCLUDED

A. Work covered by this specification shall include furnishing all labor, materials, equipment and services required to construct and install the complete electrical system shown on accompanying plans and specified herein, and make final connections to all equipment.

B. This work shall include: The general layout of the complete electrical system; arrangement of feeders, circuits, outlets, switches, controls, panelboards, transformers, service equipment, fixtures, and other work. No rough-in or connection, etc. for mechanical equipment shall be done until coordination is completed with Division 23.

1.03 RELATED WORK

A. The Contractor shall be familiar with any work specified elsewhere in these specifications. Perform this work as specified herein.

1.04 LOCAL CONDITIONS

A. Unless otherwise required or specified under another section of these specifications, cutting and patching will be performed by the Contractor. Division 26 shall furnish sketches showing locations and sizes of all openings, chases, etc. required for the installation of work.

B. Division 26 shall furnish and locate sleeves and inserts required before floors and walls are built or he shall be responsible for the cost of cutting and patching required where such sleeves and inserts are not installed or where incorrectly located. Division 26 shall do all drilling required for installation of the hangers.

C. No cutting shall be permitted to any of the structural members without the written permission of the Architect Engineer.

D. Where openings are cut to permit installation of work, or cut to repair or remodel, any defects that may appear up to expiration of guarantee, patching shall be done by the trade whose work is disturbed, but shall be paid for by the Division cutting openings or causing the damage.

E. Roof curbs for electrical openings shall be provided and flashed by the Contractor. Division 26 shall advise the Contractor as to size, location and details of curbs required.

F. The Contractor shall furnish all foundations and supports required for electrical equipment. Division 26 shall furnish an approved layout of bases and supports to the Contractor.

G. In general, all floor-mounted equipment shall be installed on raised concrete bases. Concrete bases shall be not less than 6 inches high unless otherwise noted, and shall be poured in forms built of new dressed lumber. Foundation corners shall be neatly chamfered by means of sheet metal or triangular wood strips nailed to the form. Foundation bolts shall be placed in forms when concrete is poured; bolts shall be correctly located by means of templates. Allow 1 inch below equipment bases for alignment and grouting. After grouting, the forms will be removed and the surface of the foundations shall be hand-rubbed with carborundum.

H. Division 26 shall give full cooperation to other trades, furnishing, in writing, to the Architect Engineer, any information necessary to permit work of all trades to be installed satisfactorily and with the least possible interference or delay.

I. Where work of this Division will be installed close to work of other trades, or where there is evidence that the work will interfere with work of other trades, the Division 26 shall assist in working out space conditions to make satisfactory adjustment. If the Contractor installs work before coordinating with other trades, he shall make necessary changes in his work to correct the condition without extra charge.

J. Keep work area clean at all times. Daily remove all scraps and debris from work area.

1.05 PERMITS AND INSPECTIONS

A. Give all necessary notices; obtain all permits, and pay all governmental taxes, fees and other costs in connection with work; file all necessary plans; prepare all documents and obtain all necessary approvals of all governmental departments having jurisdiction; obtain required certificates of inspection for his work and deliver same to the Architect Engineer before request for acceptance and final payment of work.

B. Contractor shall include in the work, without extra cost to the Owner, all labor, materials, services, apparatus, drawings, etc. in order to comply with all laws, ordinances, rules and regulations, whether or not shown on the drawings and/or in the specifications.

1.06 CODES AND STANDARDS

A. The following specifications and standards, of issues listed below, but referred to thereafter by basic designation only, form part of these specifications:
   1. National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Amendments and Supplements.
   2. National Electrical Safety Code.
   3. National Fire Protection Association's Recommended Practices.
   4. Local, City and State Codes and Ordinances.
   5. Underwriters Laboratories, Inc.
   6. Illuminating Engineering Society.
   7. Institute of Electrical and Electronic Engineers.
   8. Insulated Cable Engineers Association.
   9. National Electrical Manufacturers Association.
   10. American National Standards Institute.
   11. American Society for Testing Materials.
   12. State Fire Prevention Code.
   13. Occupational Health Safety Act.
   14. National Electrical Contractor Standards..

B. The latest specifications and standards available shall be used for the above.

1.07 REVIEW OF MATERIALS

A. It is the intent of these specifications to establish quality standards of materials and equipment installed. Therefore, specific items are identified by manufacturer, trade name or catalog designation.

B. Should the Contractor propose to furnish material and equipment other than that specified, he shall submit a written request for any or all substitutions to the Architect Engineer. Such request shall be alternatives to the original bid, and shall be submitted complete with descriptive (manufacturer, brand name, catalog number, etc.), and technical data for all items. The Contractor shall submit written answers to the following questions for each substitution request:
   1. Is the substitution of equal, greater or less quality than the design requirements?
   2. If of less quality, what is the difference in value?
   3. If of equal or better quality, what are the advantages to the Owner in accepting the substitution at no change in contract price?

C. Where such substitutions alter the design or space requirements indicated on the drawings, the Contractor shall include all items of cost for the revised design and include cost of all applicable trades involved.

D. Acceptance or rejection of the proposed substitutions shall be subject to the approval of the Architect Engineer. If requested by the Architect Engineer, the Contractor shall submit for inspection samples of both the specified and proposed substitute items.

E. In all cases where substitutions are permitted, the Contractor shall bear any extra cost of evaluating the equality of the material and the equipment to be installed.

F. The Contractor shall submit to the Architect Engineer detailed dimensioned shop drawings covering all items of electrical equipment. No equipment should be put into manufacture or ordered until these shop drawings or brochures have been approved by the Architect Engineer.

G. The Contractor shall submit 5 copies of the shop drawings to the Architect Engineer for comment or correction.

H. In the event resubmittal is required, the Contractor shall revise the shop drawings as directed by the Architect Engineer. The Contractor shall then resubmit 5 copies of the corrected shop drawings to the Architect Engineer for final approval.

I. As soon as practicable and within 30 days after award of contract, and before beginning fabrication of material or installation of equipment, the Contractor shall submit a complete schedule of materials, equipment, apparatus and appurtenances proposed for installation and/or use in this project to the Architect Engineer for approval.

J. This schedule shall be in the form of a bill of materials and shall include manufacturer's names, catalog numbers, diagrams and other descriptive data as required for approval. Submittal procedure shall be the same as specified above.

K. Upon completion of the project, this Contractor shall prepare and deliver to the Architect Engineer one set of red-lined "RECORD SET" prints, showing actual installed locations of all electrical conduits, ducts and cables outside and inside of the buildings, including the location of all underground junction boxes, pull boxes, handholes and manholes. Make all necessary field measurements during the installation of the electrical work.

1.08 DEVIATIONS

A. The Drawings, which constitute an integral part of the contract, shall indicate the general layout of the complete electrical systems; arrangement of feeders, circuits, outlets, switches, controls, panelboards, transformers, unit substations, service equipment, fixtures and other work.

B. Field verification of scale dimensions on the drawings is directed since actual locations, distances and levels will be governed by actual field conditions.

C. The Contractor shall check architectural, structural, plumbing, heating and ventilating to avert possible installation conflicts. Should drastic changes from original drawings be necessary to resolve such conflicts, the Contractor shall notify the Architect Engineer and secure written approval and agreement on necessary adjustments before the installation is started.

D. The drawings may be superseded by later revised or detailed drawings or specification addenda prepared by the Architect Engineer, and the Contractor shall conform to all reasonable changes without extra cost to the Owner. All items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation, shall be included.

1.09 SITE UTILITIES

A. Locations and elevations of various utilities, included within the scope of this work, have been obtained from city and utility maps and/or other substantially reliable sources, and are offered separately from contract documents as a general guide only without guarantee as to accuracy. The Contractor shall examine the site and verify to his own satisfaction the locations and elevations of all utilities and shall adequately inform himself of their relations to the work before entering into contract.

B. Voltage that appears on the drawings and elsewhere in these specifications has been obtained from the serving utility company. Before ordering equipment and starting the job, the Contractor shall verify the voltage with the utility company. If voltage differs from that noted on the drawings and in the specifications, the Architect Engineer shall be notified at once. If the Architect Engineer is not notified before equipment is ordered or construction is started, the Contractor shall provide an acceptable and operable system at no additional cost to the Owner.

C. Exterior utilities shall include all conduit and appurtenances outside of the building or as shown on the plans. Unless otherwise noted, utilities shall include complete tie-in with utility lines at no extra cost to the Owner. The Contractor shall pay all costs required by utility company

pertaining to construction and tie-in. Deposits required for permanent service shall be paid by the Owner.

1.10 ELECTRICAL LICENSE REQUIREMENT

A. No person shall perform electrical work on the contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiners Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.

B. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

PART 2 - PRODUCTS

2.01 GENERAL

A. Each item of equipment furnished under these specifications is to be essentially the standard product of the manufacturer; however, component parts of equipment need not be products of one manufacturer.

B. All material and equipment shall be new and of the best quality normally used in good commercial practice, being products of reputable manufacture. Each major component shall bear a name plate stating name and address of the manufacturer and catalog number or designation. All materials shall be of the manufacturer's latest design standard, and bear Underwriters Laboratories, Inc. label and the manufacturer's trade mark.

C. Where items of equipment and/or apparatus come under the following general headings; all of the equipment shall be from the same manufacturer:
   1. Busways, circuit breakers, load centers, metering equipment, panelboards, safety switches, starters, substations, switchboards and switchgear.

PART 3 - EXECUTION

3.01 GENERAL

A. All electrical construction work shall be installed under the direction of a competent supervisor who will be at the job site at all times when electrical installations are being made.

B. Installing Contractor will be held responsible for damage to other work resulting from negligence of his workmen. Such repairs shall be performed by the trade originally accomplishing the work but at the expense of Division 26.

C. The Contractor shall utilize only competent and skillful workmen in handling and installing equipment specified.

D. Installation shall be carried out in such a manner that the many components will function as a complete workable system including any accessories required to accomplish such installation. Equipment shall be left properly adjusted and in satisfactory working order. Work is to be executed in conformity with best acceptable standard practices with the equipment being installed to allow for maximum accessibility and best appearance. Installation shall be such that future installations and expansions can be made with a minimum of expenditure.

E. Where possible, work must be scheduled for accomplishment during periods acceptable to the Owner, but when such scheduling is not feasible, work shall be executed at night or over weekends. No additional compensation will be allowed for overtime.

F. Apparatus which is too large to permit access through stairways, doorways or shafts shall be brought to the job site by the Contractor involved and put in place before the closing of the structure.

G. Division 26 shall be responsible for the protection of electrical apparatus from damage and the elements. This shall include the erection of temporary shelters, cribbing, and the covering of apparatus in uncompleted areas of buildings with tarpaulins. Failure to comply with the foregoing by the Contractor to the satisfaction of the Architect Engineer will be sufficient cause for rejection of the piece of apparatus in question.

H. Chases, recesses, and other openings required for the location of conduits or equipment in new construction shall be provided by the Contractor. Division 26 shall advise the Contractor of the size and locations, and furnish all necessary drawings required for his work in sufficient time to allow for provision of chase.

I. After installation is complete, and at such time as the Architect Engineer may direct, the Contractor shall conduct an operating test for approval. Equipment shall be demonstrated to operate in accordance with the requirements of this specification. Test shall be performed in the presence of the Architect Engineer or authorized representative. Division 26 shall furnish instruments and personnel required for the test and Owner will furnish necessary electrical power.

J. The Contractor shall furnish a written certificate guaranteeing materials, equipment and labor furnished to be free of defects for a period of 1 year; except where otherwise indicated, from and after the date of final acceptance of the work by the Owner, and further agrees that if defects appear within stipulated guaranty period same shall be replaced or made good without charge.

3.02 SEISMIC QUALIFICTION OF EQUIPMENT

A. Provide manufacturer's certificate of compliance for the following equipment requiring seismic qualification in accordance with ASCE-7.
   1. Transformers
   2. Panel Boards
   3. Circuit Breakers
   4. Motor Starters
   5. Switch Boards
   6. Light Fixtures

END OF SECTION

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Single conductor building wire.

B. Service entrance cable.

C. Metal-clad cable.

D. Wiring connectors.

E. Electrical tape.

F. Heat shrink tubing.

G. Oxide inhibiting compound.

H. Wire pulling lubricant.

I. Cable ties.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2011).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2007 (Reapproved 2012).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

J. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

L. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

Q. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

R. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

S. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

U. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

V. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For overhead service drop, installed in raceway to service head.
      b. For underground service entrance, installed in raceway.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to damage.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet.

H. Manufactured wiring systems are not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

I. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
      a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
         1) Services: Copper conductors size 1/0 AWG and larger. Permitted at Service Entrance only, from utility transformer to Main Distribution Panel.
      b. Where aluminum conductors are substituted for copper, comply with the following:
         1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
         2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

J. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. Travelers for 3-Way and 4-Way Switching: Pink.
      d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
      e. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Cerro Wire LLC: www.cerrowire.com.
      b. Encore Wire Corporation: www.encorewire.com.
      c. Southwire Company: www.southwire.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):
      a. Encore Wire Corporation: www.encorewire.com.
      b. Southwire Company: www.southwire.com.
      c. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.
      b. Installed Underground: Type XHHW-2.

c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.04 SERVICE ENTRANCE CABLE

A. Manufacturers:
1. Copper Service Entrance Cable:
a. Cerro Wire LLC: www.cerrowire.com.
b. Encore Wire Corporation: www.encorewire.com.
c. Southwire Company: www.southwire.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Aluminum Service Entrance Cable:
a. Encore Wire Corporation: www.encorewire.com.
b. Southwire Company: www.southwire.com.
c. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

B. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.

C. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.

D. Conductor Stranding: Stranded.

E. Insulation Voltage Rating: 600 V.

2.05 METAL-CLAD CABLE

A. Manufacturers:
1. AFC Cable Systems Inc: www.afcweb.com.
2. Encore Wire Corporation: www.encorewire.com.
3. Southwire Company: www.southwire.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Provide dedicated neutral conductor for each phase conductor where indicated or required.

G. Grounding: Full-size integral equipment grounding conductor.

H. Armor: Steel, interlocked tape.

2.06 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:
1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Aluminum Conductors: Use compression connectors for all connections.
7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
8. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.07 WIRING ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
1. Manufacturers:
a. 3M: www.3m.com.

b. American Polywater Corporation: www.polywater.com.
c. Ideal Industries, Inc: www.idealindustries.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as shown on the drawings.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated and routing is not shown, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location shown.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.

D. Install aluminum conductors in accordance with NECA 104.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

G. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
   2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

J. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

K. Install conductors with a minimum of 12 inches of slack at each outlet.

L. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

M. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

N. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

O. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
   6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

P. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
      b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
   3. Wet Locations: Use heat shrink tubing.

Q. Insulate ends of spare conductors using vinyl insulating electrical tape.

R. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

S. Identify conductors and cables in accordance with Section 26 05 53.

T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

U. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground plate electrodes.

G. Ground access wells.

1.03 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
   1. Includes oxide inhibiting compound.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 56 00 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.04 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 99 - Health Care Facilities Code; 2015.

G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Field quality control test reports.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Metal In-Ground Support Structure:
   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Ring:
   a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
   b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
   c. Provide connection from ground ring conductor to:
      1) Perimeter columns of metal building frame.
      2) Ground rod electrodes located as indicated.
6. Ground Rod Electrode(s):
   a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
   b. Space electrodes not less than 10 feet from each other and any other ground electrode.
   c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   d. Provide ground access well for each electrode.
7. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
8. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

F. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

G. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
   1. Provide grounding electrode system for each separate building or structure.
   2. Provide equipment grounding conductor routed with supply conductors.
   3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
   4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

H. Separately Derived System Grounding:
   1. Separately derived systems include, but are not limited to:
      a. Transformers (except autotransformers such as buck-boost transformers).
      b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
      c. Generators, when neutral is switched in the transfer switch.
   2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
   3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
   4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
   5. Outdoor Source: Where the source of the separately derived system is located outside the building or structure supplied, provide connection to grounding electrode at source in accordance with NFPA 70.
   6. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
   7. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

I. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
   7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
      a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
      b. Metal gas piping.
   8. Provide bonding for interior metal air ducts.
   9. Provide bonding for metal building frame.
   10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
   11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
   12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

J. Communications Systems Grounding and Bonding:
   1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
   2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
      a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
      b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
      c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
      d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

K. Pole-Mounted Luminaires: Also comply with Section 26 56 00.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).
   2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
      a. Exceptions:
         1) Use mechanical connectors for connections to electrodes at ground access wells.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
      a. Exceptions:
         1) Use exothermic welded connections for connections to metal building frame.
   4. Manufacturers - Mechanical and Compression Connectors:
      a. Harger Lightning & Grounding: www.harger.com.
      b. Thomas & Betts Corporation: www.tnb.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Manufacturers - Exothermic Welded Connections:
      a. Cadweld, a brand of Erico International Corporation: www.erico.com.
      b. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
      c. Substitutions: See Section 01 60 00 - Product Requirements.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: As indicated.
   3. Holes for Connections: As indicated or as required for connections to be made.
   4. Manufacturers:
      a. Erico International Corporation: www.erico.com.
      b. Harger Lightning & Grounding: www.harger.com.

c. ThermOweld, a brand of Continental Industries, Inc: www.thermoweld.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
5. Manufacturers:
a. Erico International Corporation: www.erico.com.
b. Galvan Industries, Inc: www.galvanelectrical.com.
c. Harger Lightning & Grounding: www.harger.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Ground Plate Electrodes:
1. Material: Copper.
2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
3. Manufacturers:
a. Erico International Corporation: www.erico.com.
b. Harger Lightning & Grounding: www.harger.com.
c. Substitutions: See Section 01 60 00 - Product Requirements.

G. Ground Access Wells:
1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
a. Round Wells: Not less than 8 inches in diameter.
b. Rectangular Wells: Not less than 12 by 12 inches.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".
5. Manufacturers:
a. Erico International Corporation: www.erico.com.
b. Harger Lightning & Grounding: www.harger.com.
c. Substitutions: See Section 01 60 00 - Product Requirements.

H. Oxide Inhibiting Compound: Comply with Section 26 05 19.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as shown on the drawings.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.

E. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

F. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 34 - Conduit: Additional support and attachment requirements for conduits.

D. Section 26 05 37 - Boxes: Additional support and attachment requirements for boxes.

E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.04 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

E. Installer's Qualifications: Include evidence of compliance with specified requirements.

F. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.07 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
   3. Manufacturers:

a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
b. Erico International Corporation: www.erico.com.
c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
d. Thomas & Betts Corporation: www.tnb.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
b. Erico International Corporation: www.erico.com.
c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
d. Thomas & Betts Corporation: www.tnb.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
3. Channel Material:
a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
5. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
6. Manufacturers:
a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
b. Thomas & Betts Corporation: www.tnb.com.
c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
d. Substitutions: See Section 01 60 00 - Product Requirements.
e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
a. Equipment Supports: 1/2 inch diameter.
b. Busway Supports: 1/2 inch diameter.
c. Single Conduit up to 1 inch (27mm) trade size: 1/4 inch diameter.
d. Single Conduit larger than 1 inch (27mm) trade size: 3/8 inch diameter.
e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
f. Outlet Boxes: 1/4 inch diameter.
g. Luminaires: 1/4 inch diameter.

G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
4. Manufacturers:
a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
b. Erico International Corporation: www.erico.com.

c. PHP Systems/Design: www.phpsd.com.
d. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

H. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Hammer-driven anchors and fasteners are not permitted.
12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Comply with MFMA-4.
b. Channel Material: Use galvanized steel.
c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
14. Manufacturers - Mechanical Anchors:
a. Hilti, Inc: www.us.hilti.com.
b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
c. Powers Fasteners, Inc: www.powers.com.
d. Simpson Strong-Tie Company Inc: www.strongtie.com.
e. Substitutions: See Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Architect Engineer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Architect Engineer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.
   5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Conduit Support and Attachment: Also comply with Section 26 05 34.

J. Box Support and Attachment: Also comply with Section 26 05 37.

K. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.

L. Exterior Luminaire Support and Attachment: Also comply with Section 26 56 00.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners according to manufacturer's recommended torque settings.

O. Remove temporary supports.

P. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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SECTION 26 05 34
CONDUIT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Conduit fittings.

H. Accessories.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete encasement of conduits.

B. Section 07 84 00 - Firestopping.

C. Section 22 05 48 - Vibration Isolation and Seismic Control (For Seismic Bracing of Conduit, Equipment and Boxes)

D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.

E. Section 26 05 29 - Hangers and Supports for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

G. Section 26 21 00 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

H. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Additional requirements for communications systems conduits.

I. Section 31 23 16 - Excavation.

J. Section 31 23 23 - Fill: Bedding and backfilling.

1.04 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.

B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:
   1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
   2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

C. Multi-trade Coordination: In lieu of detailed shop drawings, the Contractor may conduct a pre-installation and coordination meeting, with follow-up meetings to coordinate routing of mechanical, fire protection and electrical elements. Locations and conflict resolutions shall be made during these meetings. Notify Architect-Engineer of meeting times and dates. Do not install any conduit until this meeting has taken place.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit or rigid PVC conduit.
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit or rigid PVC conduit.
   3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit or rigid PVC conduit.
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
   6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.

D. Embedded Within Concrete:
   1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit or rigid PVC conduit.
   2. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit.
   3. Within Concrete Walls Above Ground: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from concrete.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
      b. Where exposed below 20 feet in warehouse areas.

K. Exposed, Exterior: Use galvanized steel rigid metal conduit.

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

M. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet.

N. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

O. Panelboard feeders: Use galvanized steel rigid metal conduit.

P. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.02 CONDUIT REQUIREMENTS

A. Electrical Service Conduits: Also comply with Section 26 21 00.

B. Communications Systems Conduits: Also comply with Section 27 10 05.

C. Fittings for Grounding and Bonding: Also comply with Section 26 05 26.

D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4 inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Control Circuits: 1/2 inch (16 mm) trade size.
   4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
   5. Underground, Interior: 1 inch (27 mm) trade size.
   6. Underground, Exterior: 1 inch (27 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedeg.com.
   2. Republic Conduit: www.republic-conduit.com.
   3. Wheatland Tube Company: www.wheatland.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com.
      b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
      c. Thomas & Betts Corporation: www.tnb.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
   4. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
   1. Allied Tube & Conduit: www.alliedeg.com.
   2. Republic Conduit: www.republic-conduit.com.
   3. Wheatland Tube Company: www.wheatland.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com.
      b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
      c. Thomas & Betts Corporation: www.tnb.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
   4. Material: Use steel or malleable iron.
      a. Do not use die cast zinc fittings.
   5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.
   6. More than Five Feet from Foundation Wall:
      a. In Dirt: Use rigid steel conduit.
      b. Under Road: Use rigid steel conduit.

D. Slab Penetrations:
   1. Vertical penetrations: Use rigid steel conduit.
   2. Elbows: Use rigid steel conduit.

E. Motor and other moving equipment connections:
   1. Dry locations: Flexible steel conduit.
   2. Damp locations: Liquid-tight flexible steel conduit.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc; _____: www.afcweb.com.
   2. Flex Tubes: www.flex-tubes.com
   3. Electri-Flex Company; _____: www.electriflex.com.
   4. International Metal Hose; _____: www.metalhose.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
   1. Manufacturers:
      a. Bridgeport Fittings Inc: www.bptfittings.com.
      b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
      c. Thomas & Betts Corporation: www.tnb.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
1. AFC Cable Systems, Inc; _____: www.afcweb.com.
2. Electri-Flex Company; _____: www.electriflex.com.
3. International Metal Hose; _____: www.metalhose.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com.
   b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
   c. Thomas & Betts Corporation: www.tnb.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit; _____: www.alliedeg.com.
2. Republic Conduit: www.republic-conduit.com.
3. Wheatland Tube Company; _____: www.wheatland.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com.
   b. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
   c. Thomas & Betts Corporation: www.tnb.com.
   d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
   a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression (gland) or set-screw type.
   a. Do not use indenter type connectors and couplings.
5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

2.08 NONMETALLIC CONDUIT

A. Manufacturers:
1. Cantex Inc: www.cantexinc.com.
2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com.
3. JM Eagle: www.jmeagle.com.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.09 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

F. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated and routing is not shown, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.

8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
    a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

H. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.

5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

J. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape in accordance with Section 26 05 53 along entire conduit length.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Include proposed conduit arrangement with submittals.
2. Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
3. Secure conduits to prevent floating or movement during pouring of concrete.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

M. Hazardous (Classified) Locations: Where conduits cross boundaries of hazardous (classified) locations, provide sealing fittings located as indicated or in accordance with NFPA 70.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

O. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
3. Where conduits penetrate coolers or freezers.

P. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

Q. Provide grounding and bonding in accordance with Section 26 05 26.

R. Identify conduits in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 05 35
SURFACE RACEWAYS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Surface raceway systems.

B. Wireways.

1.03 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 34 - Conduit.

D. Section 26 05 37 - Boxes.

E. Section 26 27 26 - Wiring Devices: Receptacles.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. UL 5 - Surface Metal Raceways and Fittings; Current Edition, Including All Revisions.

E. UL 5A - Nonmetallic Surface Raceways and Fittings; Current Edition, Including All Revisions.

F. UL 111 - Outline of Investigation for Multioutlet Assemblies; Current Edition, Including All Revisions.

G. UL 870 - Wireways, Auxiliary Gutters, and Associated Fittings; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of raceways with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate rough-in locations of outlet boxes provided under Section 26 05 37 and conduit provided under Section 26 05 34 as required for installation of raceways provided under this section.
   3. Verify minimum sizes of raceways with the actual conductors and components to be installed.
   4. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install raceways until final surface finishes and painting are complete.
   2. Do not begin installation of conductors and cables until installation of raceways is complete between outlet, junction and splicing points.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.

1. Surface Raceway Systems: Include information on fill capacities for conductors and cables.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 RACEWAY REQUIREMENTS

A. Provide all components, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Do not use raceways for applications other than as permitted by NFPA 70 and product listing.

2.02 SURFACE RACEWAY SYSTEMS

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
2. MonoSystems, Inc: www.monosystems.com.
3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Surface Metal Raceways: Listed and labeled as complying with UL 5.

C. Surface Nonmetallic Raceways: Listed and labeled as complying with UL 5A.

D. Multioutlet Assemblies: Listed and labeled as complying with UL 111.

2.03 WIREWAYS

A. Manufacturers:
1. Cooper B-Line, a division of Cooper Industries: www.cooperindustries.com.
2. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
3. Schneider Electric; Square D Products: www.schneider-electric.us.
4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Lay-in wireways and wiring troughs with removable covers; listed and labeled as complying with UL 870.

C. Wireway Type, Unless Otherwise Indicated:
1. Indoor Clean, Dry Locations: NEMA 250, Type 1, painted steel with screw-cover.

D. Finish for Painted Steel Wireways: Manufacturer's standard grey unless otherwise indicated.

E. Minimum Wireway Size: 2.5 by 2.5 inches unless otherwise indicated.

F. Where wireway size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.04 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test each production unit for pre-wired surface raceway systems to verify proper wiring.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes and conduit terminations are installed in proper locations and are properly sized in accordance with NFPA 70 to accommodate raceways.

C. Verify that mounting surfaces are ready to receive raceways and that final surface finishes are complete, including painting.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install raceways in a neat and workmanlike manner in accordance with NECA 1.

C. Install raceways plumb and level.

D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.

E. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.

F. Close unused raceway openings.

G. Provide grounding and bonding in accordance with Section 26 05 26.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect raceways for damage and defects.

C. Surface Raceway Systems with Integrated Devices: Test each wiring device to verify operation and proper polarity.

D. Correct wiring deficiencies and replace damaged or defective raceways.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 PROTECTION

A. Protect installed raceways from subsequent construction operations.

END OF SECTION

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SECTION 26 05 37
BOXES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Floor boxes.

D. Underground boxes/enclosures.

1.03 RELATED REQUIREMENTS

A. Section 08 31 00 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 34 - Conduit:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

D. Section 26 05 35 - Surface Raceways:
   1. Accessory boxes designed specifically for surface raceway systems.
   2. Lay-in wireways and wiring troughs with removable covers.

E. Section 26 27 26 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Additional requirements for locating boxes for wiring devices.

F. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Additional requirements for communications systems outlet boxes.

G. Section 23 05 48 - Heating, Ventilation and Air-Conditioning (HVAC) Vibration Isolation And Seismic Restraint.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.

F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, floor boxes, and underground boxes/enclosures.

C. Project Record Documents: Record actual locations for pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use nonmetallic boxes where exposed rigid PVC conduit is used.
5. Use suitable concrete type boxes where flush-mounted in concrete.
6. Use suitable masonry type boxes where flush-mounted in masonry walls.
7. Use raised covers suitable for the type of wall construction and device configuration where required.
8. Use shallow boxes where required by the type of wall construction.
9. Do not use "through-wall" boxes designed for access from both sides of wall.
10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
12. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
13. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
14. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
15. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 3-1/2 inch deep.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
16. Wall Plates: Comply with Section 26 27 26.
17. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.
    c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
    d. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    e. Thomas & Betts Corporation: www.tnb.com.
    f. Substitutions: See Section 01 60 00 - Product Requirements.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations: Type 3R, painted steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
5. Manufacturers:
    a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
    b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
    c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Floor Boxes:

1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
2. Use cast iron floor boxes within slab on grade.
3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
4. Manufacturer: Same as manufacturer of floor box service fittings.

E. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As indicated on drawings.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
4. Applications:
a. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

G. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 31 00 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.

a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.

10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 34.
11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

H. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

K. Install boxes as required to preserve insulation integrity.

L. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

M. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 26 05 26.

S. Do not mount boxes back-to-back.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Conduit and raceway markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

H. Instruction signs.

1.03 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting.

B. Section 09 91 23 - Interior Painting.

C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

E. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Identification for communications cabling and devices.

1.04 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:
   1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
   2. Do not install identification products until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittals procedures.

B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.07 QUALITY ASSURANCE

A. Comply with requirements of the National Electrical Code - NFPA 70 (NEC).

1.08 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Use identification nameplate to identify main overcurrent protective device.
         5) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
         5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
         6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
      c. Enclosed switches and circuit breakers:
         1) Identify voltage and phase.
         2) Identify power source and circuit number. Include location when not within sight of equipment.
         3) Identify load(s) served. Include location when not within sight of equipment.
   2. Service Equipment:
      a. Use identification nameplate to identify each service disconnecting means.
      b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
   3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
   4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
   5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
   6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.

7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
10. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
    a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 91 23 and 09 91 13.
11. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
    a. Service equipment.
12. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
    a. Minimum Size: 3.5 by 5 inches.
    b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
    c. Service Equipment: Include the following information in accordance with NFPA 70.
        1) Nominal system voltage.
        2) Available fault current.
        3) Clearing time of service overcurrent protective device(s).
        4) Date label applied.
13. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
14. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
15. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
16. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment.

C. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 27 10 05.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
3. Use identification label to identify serving branch circuit for all receptacles.

4. Use identification label to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
      a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
   4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
   5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Manufacturers:
      a. Brady Corporation: www.bradyid.com.
      b. Brother International Corporation: www.brother-usa.com.
      c. Panduit Corp: www.panduit.com.
      d. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
      a. Use only for indoor locations.
   3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend:
      a. System designation where applicable:
         1) Fire Alarm System: Identify with text "FIRE ALARM".
      b. Equipment designation or other approved description.
      c. Other information as indicated.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch.
      b. Equipment Designation: 1/2 inch.
      c. Other Information: 1/4 inch.
   5. Color:
      a. Normal Power System: White text on black background.
      b. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/4 inch.
   5. Color: Black text on white background unless otherwise indicated.

a. Exceptions:
1) Provide white text on red background for general information or operational instructions for fire alarm systems.

E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches by 4 inches.
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch.
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
a. Include voltage and phase for other than 120 V, single phase circuits.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Black text on clear background.

G. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

H. Nameplate Inscription:
1. Nameplates must adequately describe the function or use of the particular equipment to which it is attached. Where nameplates are detailed on the drawings, inscription and size of leters shall be as shown. Nameplates for panelboards and switchboards shall include the panel designation, voltage and phase of the supply. Example: "Panel A, 277/480 v, 3-phase, 4-wire".
2. The name of the machine on the motor nameplates for a particular machine shall be the same as the one used on all motor starters, disconnect and PB station nameplates for that machine.
3. Use 1-7/8 inch letters for identifying signs on enclosures containing high voltage equipment. Signs shall read "DANGER - HIGH VOLTAGE".
4. Warning signs (items 3 & 4 above) to be of standard manufacture, fabricated of 18 ga. steel, or heavier, with a porcelain enamel finish. Letters shall be red on white background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com.
2. HellermannTyton: www.hellermanntyton.com.
3. Panduit Corp: www.panduit.com.
4. Seton Identification Products: www.seton.com/aec.
5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:
   1. Brady Corporation: www.bradyid.com.
   2. Brimar Industries, Inc: www.brimar.com.
   3. Seton Identification Products: www.seton.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
   1. Markers for Equipment: 1 1/8 by 4 1/2 inches.

E. Legend:
   1. Markers for Voltage Identification: Highest voltage present.

F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Manufacturers:
   1. Brady Corporation: www.bradyid.com.
   2. Brimar Industries, Inc: www.brimar.com.
   3. Seton Identification Products: www.seton.com.
   4. The C. H Hanson Co.: www.chhanson.com
   5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
   1. Exception: Use foil-backed detectable type tape where required by serving utility or where directed by Owner.

C. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

D. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

E. Legend: Type of service, continuously repeated over full length of tape.

F. Color:
   1. Tape for Buried Power Lines: Black text on red background.
   2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.06 FLOOR MARKING TAPE

A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.

2.07 WARNING SIGNS AND LABELS

A. Manufacturers:
   1. Brimar Industries, Inc: www.brimar.com.
   2. Clarion Safety Systems, LLC: www.clarionsafety.com.
   3. Seton Identification Products: www.seton.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
   1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

D. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
a. Do not use labels designed to be completed using handwritten text.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Boxes: Outside face of cover.
8. Conductors and Cables: Legible from the point of access.
9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

C. Install wire, cable and underground markers per manufacturers' instructions.

D. Install conduit, raceway and instructions signs parallel to lines and surrounding surfaces. Install instruction signs in a clearly visible location, straight and square to surroundings.

END OF SECTION

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SECTION 26 05 73
POWER SYSTEM STUDIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Protective device coordination study.

B. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.03 RELATED REQUIREMENTS

A. Section 26 24 13 - Switchboards.

B. Section 26 24 16 - Panelboards.

C. Section 26 28 13 - Fuses.

1.04 REFERENCE STANDARDS

A. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001.

B. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

C. NEMA MG 1 - Motors and Generators; 2014.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
   2. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Submit study reports prior to or concurrent with product submittals.
   2. Do not order equipment until matching study reports and product submittals have both been evaluated by Architect Engineer.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Study reports, stamped or sealed and signed by study preparer.

C. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

D. Project Record Documents: Revise studies as required to reflect as-built conditions.
   1. Include hard copies with operation and maintenance data submittals.
   2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

1.07 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.

B. General Study Requirements:
1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:
1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
   a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      1) Obtain up-to-date information from Utility Company.
   b. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
   c. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
   d. Protective Devices:
      1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
      2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
   e. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
   f. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. Analyze protective devices and associated settings for suitable margins between time-current curves to achieve full selective coordination while providing adequate protection for equipment and conductors.

E. Study Reports:
1. General Requirements:
   a. Identify date of study and study preparer.
   b. Identify study methodology and software product(s) used.
   c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
   d. Identify base used for per unit values.
   e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
   f. Include conclusions and recommendations.
2. Protective Device Coordination Study:
   a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.

b. For each graph include (where applicable):
   1) Partial single-line diagram identifying the portion of the system illustrated.
   2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
   3) Conductors: Damage curves.
   4) Transformers: Inrush points and damage curves.
   5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
   6) Motors: Full load current, starting curves, and damage curves.
   7) Capacitors: Full load current and damage curves.
c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
   1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
   2) Include ground fault pickup and delay.
   3) Include fuse ratings.
   4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.

1.08 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State of Arkansas and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.

B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
   1. Acceptable Software Products:
      a. Power Analytics Corporation: www.poweranalytics.com.
      b. SKM Systems Analysis, Inc: www.skm.com.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Architect Engineer of any conflicts with or deviations from studies. Obtain direction before proceeding.

END OF SECTION

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SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. In-wall interval timers.

D. Outdoor photo controls.

1.03 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches and wall dimmers.
   1. Includes finish requirements for wall controls specified in this section.

D. Section 26 51 00 - Interior Lighting.

E. Section 26 56 00 - Exterior Lighting.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

G. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

H. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

I. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
   3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
   4. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install lighting control devices until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

H. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all occupancy sensors.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

A. Manufacturers:
   1. Hubbell Building Automation, Inc: www.hubbellautomation.com
   2. Lutron Electronics Company, Inc: www.lutron.com.
   3. Sensor Switch Inc: www.sensorswitch.com.
   4. WattStopper: www.wattstopper.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.

6. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. All Occupancy Sensors:
   1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
   2. Sensor Technology:
      a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
      b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
      c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
      d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and audible sound sensing technologies.
   3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
   4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
   5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
   6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
   7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
   8. Sensitivity: Field adjustable.
   9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
   10. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
   11. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on the drawings.
   12. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.

C. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Unless otherwise indicated or required to control the load indicated on the drawings, provide line voltage units with self-contained relay.
      c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
      d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
      e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
      f. Provide selectable audible alert to notify occupant of impending load turn-off.

g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 400 square feet.
4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:
1. General Requirements:
a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
e. Provide fade-to-off operation to notify occupant of impending load turn-off.
f. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.

2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

E. Ceiling Mounted Occupancy Sensors:
1. All Ceiling Mounted Occupancy Sensors:
a. Description: Low profile occupancy sensors designed for ceiling installation.
b. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
c. Provide field selectable setting for disabling LED motion detector visual indicator.
d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
e. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

3. Ultrasonic Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.

4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
   b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet.

F. Directional Occupancy Sensors:
   1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
      a. Unless otherwise indicated or required to control the load indicated on the drawings, provide low voltage units, for use with separate compatible accessory power packs.
      b. Provide field selectable setting for disabling LED motion detector visual indicator.
      c. Finish: White unless otherwise indicated.
   2. Passive Infrared (PIR) Directional Occupancy Sensors:
      a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
   3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

G. Power Packs for Low Voltage Occupancy Sensors:
   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
   2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on the drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.
   4. Load Rating:
      a. Incandescent Load: Not less than 15 A.
      b. Fluorescent Load: Not less than 20 A.

2.03 TIME SWITCHES

A. Manufacturers:
   1. Intermatic, Inc: www.intermatic.com.
   2. Tork, a division of NSI Industries LLC: www.tork.com.
   3. Substitutions: See Section 01 60 00 - Product Requirements.
   4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic Time Switches:
   1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
   2. Program Capability:
      a. Astronomic Time Switches: Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
   3. Schedule Capacity: Not less than 16 programmable on/off operations.
   4. Provide automatic daylight savings time and leap year compensation.
   5. Provide power outage backup to retain programming and maintain clock.
   6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
   7. Provide remote photocell input with light level adjustment.
   8. Input Supply Voltage: As indicated on the drawings.
   9. Output Switch Contact Ratings:
      a. Resistive Load: Not less than 30 A at 120-277 V ac.

b. Ballast Load: Not less than 30A.

10. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
    a. Indoor clean, dry locations: Type 1.

2.04 IN-WALL INTERVAL TIMERS

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com.
2. Tork, a division of NSI Industries LLC: www.tork.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.
4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Digital Electronic In-Wall Interval Timers:
1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
2. Program Capability: Designed to turn load off at end of preset time interval.
3. Time Interval: Field selectable range of presets available up to 12 hours.
4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
7. Switch Configuration: Suitable for use in either SPST or 3-way application.

2.05 OUTDOOR PHOTO CONTROLS

A. Manufacturers:
1. Intermatic, Inc: www.intermatic.com.
2. Tork, a division of NSI Industries LLC: www.tork.com.
3. Substitutions: See Section 01 60 00 - Product Requirements.
4. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

B. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.
9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of lighting control devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
      b. In-Wall Time Switches: 48 inches above finished floor.
      c. In-Wall Interval Timers: 48 inches above finished floor.
   2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
   3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect Engineer to obtain direction prior to proceeding with work.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

H. Identify lighting control devices in accordance with Section 26 05 53.

I. Occupancy Sensor Locations:
   1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
   2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

L. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

M. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

N. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

O. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Test outdoor photo controls to verify proper operation, including time delays where applicable.

F. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect Engineer.

C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.

D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect Engineer. Record settings in written report to be included with submittals.

F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect Engineer.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 COMMISSIONING

A. See Section 01 91 13 - General Commissioning Requirements for commissioning requirements.

3.08 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect Engineer, and correct deficiencies or make adjustments as directed.

D. Training: Train 's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.

3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
4. Location: At project site.

END OF SECTION

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SECTION 26 21 00

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Electrical service requirements.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for cast-in-place concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 24 13 - Switchboards: Service entrance equipment.

F. Section 31 23 16 - Excavation.

G. Section 31 23 23 - Fill: Bedding and backfilling.

1.04 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
      c. Utility easement requirements.
      d. Utility Company charges associated with providing service.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
   5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Owner.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:
   1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Project Record Documents: Record actual locations of equipment and installed service routing.

1.07 QUALITY ASSURANCE

A. Comply with the following:
   1. IEEE C2 (National Electrical Safety Code).
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.
   4. The requirements of the local authorities having jurisdiction.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility: As indicated on drawings.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 31 23 16 and Section 31 23 23.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 30 00.

F. Provide required support and attachment components in accordance with Section 26 05 29.

G. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.

H. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

3.04 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION

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SECTION 26 24 13
SWITCHBOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

F. Section 26 21 00 - Low-Voltage Electrical Service Entrance.

G. Section 26 43 00 - Surge Protective Devices.

1.04 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2008.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

F. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

G. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; 2013.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

K. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

L. UL 891 - Switchboards; Current Edition, Including All Revisions.

M. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:
1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
3. Obtain Utility Company approval of switchboard prior to fabrication.
4. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
4. Include documentation of listed series ratings upon request.
5. Include documentation demonstrating selective coordination upon request.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Field Quality Control Test Reports.

H. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

I. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Enclosure Keys: Two of each different key.
3. Drawout Devices:
a. Handles Necessary for Racking of Devices: One for each electrical room containing switchgear with drawout devices.

b. Lifting Yokes: One of each different yoke required, for each electrical room containing drawout devices.
c. Removable Covers: One for blocking each different opening size when device is temporarily removed from its compartment.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Switchboards:
1. Eaton Corporation: www.eaton.com.
2. General Electric Company: www.geindustrial.com.
3. Schneider Electric; Square D Products: www.schneider-electric.us.
4. Siemens Industry, Inc: www.usa.siemens.com.

B. Source Limitations: Furnish switchboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:
1. Main Device(s): Individually-mounted.
2. Feeder Devices: Panel/group-mounted.
3. Arrangement: Front accessible only (not rear accessible), rear aligned.
4. Gutter Access: Bolted covers.

E. Rear-Connected Switchboards:
1. Main Device(s): Individually-mounted.
2. Feeder Devices: Individually-mounted.
3. Compartmentalization: Provide barriered compartments for each overcurrent protective device, distribution bus, and rear cable connection area.
4. Arrangement: Rear accessible, front and rear aligned.
5. Rear Access: Bolted covers.

F. Service Entrance Switchboards:
   1. Listed and labeled as suitable for use as service equipment according to UL 869A.
   2. For solidly-grounded wye systems, provide factory-installed main bonding jumper between neutral and ground busses, and removable neutral disconnecting link for testing purposes.
   3. Comply with Utility Company requirements for electrical service.
   4. Utility Metering Provisions: Provide separate barriered compartment complying with Utility Company requirements where indicated or where required by Utility Company. Include hinged sealable door and provisions for Utility Company current transformers (CTs), potential transformers (PTs), or potential taps as required.

G. Service Conditions:
   1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
      a. Altitude: Less than 6,600 feet.
      b. Ambient Temperature:
         1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F and 104 degrees F.

H. Short Circuit Current Rating:
   1. Provide switchboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

I. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

J. Bussing: Sized in accordance with UL 891 temperature rise requirements.
   1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
   2. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   3. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Phase and Neutral Bus Material: Copper.
   5. Ground Bus Material: Copper.

K. Conductor Terminations: Suitable for use with the conductors to be installed.
   1. Line Conductor Terminations:
      a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Main and Neutral Lug Type: Mechanical.
   2. Load Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Lug Type:

L. Enclosures:
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1 or Type 2 (drip-proof).
   2. Finish: Manufacturer's standard unless otherwise indicated.

M. Future Provisions:
   1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
   2. Equip distribution sections with full height vertical bussing to accommodate maximum utilization of space for devices.
   3. Arrange and equip through bus and ground bus to accommodate future installation of additional switchboard sections where indicated.

N. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list switchboards as a complete assembly including surge protective device.

O. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where overcurrent protective devices equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
      a. Use zero sequence or residual ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

P. Instrument Transformers:
   1. Comply with IEEE C57.13.
   2. Select suitable ratio, burden, and accuracy as required for connected devices.
   3. Current Transformers: Connect secondaries to shorting terminal blocks.
   4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:
   1. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   2. Molded Case Circuit Breakers:
      a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
         1) Provide thermal magnetic circuit breakers unless otherwise indicated.
         2) Provide electronic trip circuit breakers where indicated.
      b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
         1) Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
         2) Provide interchangeable trip units where indicated.
      c. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
         1) Provide the following field-adjustable trip response settings:
            (a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
            (b) Long time delay.
            (c) Short time pickup and delay.
            (d) Instantaneous pickup.
            (e) Ground fault pickup and delay where ground fault protection is indicated.
         2) Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
         3) Provide communication capability where indicated: Compatible with system indicated.
      d. Provide the following circuit breaker types where indicated:

1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
2) Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

e. Provide the following features and accessories where indicated or where required to complete installation:
1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

3. Insulated Case Circuit Breakers:
a. Description: Quick-make, quick-break, trip-free circuit breakers with two-step stored energy closing mechanism; standard 80 percent rated unless otherwise indicated; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
b. Operation:
1) Provide manually operated circuit breakers unless otherwise indicated.
2) Provide electrically operated circuit breakers where indicated.
3) Pad-Lock Provision: For preventing circuit breaker closing operation.
c. Construction:
1) Provide fixed-mount circuit breakers unless otherwise indicated.
2) Provide drawout circuit breakers where indicated.
d. Drawout Circuit Breakers:
1) Allows withdrawal of circuit breaker into test and disconnected positions, with racking position indication (connected, test, disconnected, withdrawn).
2) Provide safety interlock to prevent racking of circuit breaker while in the ON position.
3) Pad-Lock Provision: For preventing circuit breaker drawout operation.
e. Minimum Interrupting Capacity:
1) 42,000 rms symmetrical amperes at 240 VAC or 208 VAC.
2) 65,000 rms symmetrical amperes at 480 VAC.
f. Trip Units: Solid state, microprocessor-based, true rms sensing.
1) Provide the following field-adjustable trip response settings:
(a) Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
(b) Long time delay.
(c) Short time pickup and delay.
(d) Instantaneous pickup.
(e) Ground fault pickup and delay where ground fault protection is indicated.
2) Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.
3) Provide communication capability where indicated: Compatible with system indicated.
g. Provide the following circuit breaker types where indicated:
1) 100 Percent Rated Circuit Breakers: Listed for application within the switchboard where installed at 100 percent of the continuous current rating.
2) Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
h. Provide the following features and accessories where indicated or where required to complete installation:

1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.04 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
   1. Dielectric tests.
   2. Mechanical operation tests.
   3. Grounding of instrument transformer cases test.
   4. Electrical operation and control wiring tests, including polarity and sequence tests.
   5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch between switchboard and wall.

E. Provide required support and attachment components in accordance with Section 26 05 29.

F. Install switchboards plumb and level.

G. Unless otherwise indicated, mount switchboards on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed devices, components, and accessories.

J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

K. Set field-adjustable circuit breaker tripping function settings as indicated.

L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

M. Provide filler plates to cover unused spaces in switchboards.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

D. Inspect and test in accordance with NETA ATS, except Section 4.

E. Perform inspections and tests listed in NETA ATS, Section 7.1.

F. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

G. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

H. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10.

I. Test shunt trips to verify proper operation.

J. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of switchboard covers and doors.

3.05 CLEANING

A. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of switchboard and associated devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.
   3. Instructor: Manufacturer's authorized representative.
   4. Location: At project site.

3.07 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.03 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.04 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

M. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

N. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.

D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Two of each different key.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.

B. General Electric Company: www.geindustrial.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Listed series ratings are not acceptable.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide 200 percent rated neutral bus and lugs where indicated, where oversized neutral conductors are provided, or where panelboards are fed from K-rated transformers.
   3. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   4. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
      b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
      c. Provide painted steel boxes for surface-mounted panelboards, finish to match fronts.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

K. Load centers are not acceptable.

L. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.
2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Copper.
   2. Ground Bus Material: Copper.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
   2. Provide thermal magnetic circuit breakers unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
         2) 14,000 rms symmetrical amperes at 480 VAC.

b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
   c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
   d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
9. Provide the following features and accessories where indicated or where required to complete installation:
   a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
   b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
   c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
   d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
   e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.06 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install panelboards plumb.

F. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

I. Provide grounding and bonding in accordance with Section 26 05 26.
   1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
   2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.

J. Install all field-installed branch devices, components, and accessories.

K. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

M. Provide filler plates to cover unused spaces in panelboards.

N. Identify panelboards in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Test AFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 27 17
EQUIPMENT WIRING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Electrical connections to equipment.

1.03 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 05 34 - Conduit.

C. Section 26 05 37 - Boxes.

D. Section 26 27 26 - Wiring Devices.

1.04 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disconnect Switches: As specified in Division 23 and in individual equipment sections.

B. Wiring Devices: As specified in Section 26 27 26.

C. Flexible Conduit: As specified in Section 26 05 34.

D. Wire and Cable: As specified in Section 26 05 19.

E. Boxes: As specified in Section 26 05 37.

2.02 EQUIPMENT CONNECTIONS

A. Coordinate Requirements with Division 23 (15):
   1. Electrical Connection: Flexible conduit.
   2. Provide field-installed disconnect switch where required.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

1.03 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 27 17 - Equipment Wiring: Cords and plugs for equipment.

1.04 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
   4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

6. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:
1. Do not install wiring devices until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Project Record Documents: Record actual installed locations of wiring devices.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hubbell Incorporated: www.hubbell-wiring.com.

B. Leviton Manufacturing Company, Inc: www.leviton.com.

C. Lutron Electronics Company, Inc: www.lutron.com.

D. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

E. Source Limitations: Where possible, provide products for each type of wiring device produced by a single manufacturer and obtained from a single supplier.

F. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

2.02 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide GFCI protection for receptacles installed within 6 feet of sinks.

E. Provide GFCI protection for receptacles installed in kitchens.

F. Provide GFCI protection for receptacles serving electric drinking fountains.

G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.03 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Ivory with ivory nylon wall plate.

2.04 WALL SWITCHES

A. Manufacturers:
1. Hubbell Incorporated: www.hubbell-wiring.com.
2. Leviton Manufacturing Company, Inc: www.leviton.com.

3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.05 WALL DIMMERS

A. Manufacturers:
   1. Leviton Manufacturing Company, Inc: www.leviton.com.
   2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com.
   3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

2.06 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Leviton Manufacturing Company, Inc: www.leviton.com.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
   4. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.07 WALL PLATES

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Leviton Manufacturing Company, Inc: www.leviton.com.
   3. Lutron Electronics Company, Inc; _____: www.lutron.com.
   4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.08 FLOOR BOX SERVICE FITTINGS

A. Manufacturers:
   1. Hubbell Incorporated: www.hubbell-wiring.com.
   2. Thomas & Betts Corporation: www.tnb.com.
   3. Wiremold, a brand of Legrand North America, Inc: www.legrand.us
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Description: Service fittings compatible with floor boxes provided under Section 26 05 37 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:
   1. Accessories:
      a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
      b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches above finished floor.
      b. Wall Dimmers: 48 inches above finished floor.
      c. Receptacles: 18 inches above finished floor or 6 inches above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect Engineer to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or

improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Do not install devices back-to-back.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch and wall dimmer with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 28 17
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Enclosed circuit breakers.

1.03 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 05 73 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.04 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

K. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of circuit breaker upon request.

C. Field Quality Control Test Reports.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Project Record Documents: Record actual installed locations of enclosed circuit breakers.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. General Electric Company; _____: www.geindustrial.com.

C. Schneider Electric; Square D Products; _____: www.schneider-electric.us.

D. Siemens Industry, Inc; _____: www.usa.siemens.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between 23 degrees F and 104 degrees F.

D. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
   2. Listed series ratings are not acceptable.

E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Provide thermal magnetic circuit breakers unless otherwise indicated.

H. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

I. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
   3. Provide surface-mounted enclosures unless otherwise indicated.

K. Provide externally operable handle with means for locking in the OFF position.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion circuit breakers with ground-fault shunt trips.
      a. Use zero sequence ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. 14,000 rms symmetrical amperes at 480 VAC.
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Provide mechanical lugs unless otherwise indicated.
   2. Provide compression lugs where indicated.
   3. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.

E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

F. Provide the following circuit breaker types where indicated:

1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
2. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

G. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

H. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

I. Provide the following features and accessories where indicated or where required to complete installation:
1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed circuit breakers securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed circuit breakers plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 05 73.

J. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

K. Identify enclosed circuit breakers in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

E. Test GFCI circuit breakers to verify proper operation.

F. Test shunt trips to verify proper operation.

G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 28 18
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Enclosed safety switches.

1.03 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.09 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Eaton Corporation; _____: www.eaton.com.

B. General Electric Company; _____: www.geindustrial.com.

C. Schneider Electric; Square D Products; _____: www.schneider-electric.us.

D. Siemens Industry, Inc; _____: www.usa.siemens.com.

E. Substitutions: See Section 01 60 00 - Product Requirements.

F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Provide compression lugs where indicated.
      c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
      a. Provide means for locking handle in the ON position where indicated.

N. Provide the following features and accessories where indicated or where required to complete installation:
   1. Hubs: As required for environment type; sized to accept conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

H. Identify enclosed switches in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 43 00
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

1.03 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 24 13 - Switchboards.

1.04 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.05 REFERENCE STANDARDS

A. MIL-STD-220 - Method of Insertion Loss Measurement; Revision C, 2009.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

G. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to ordering equipment.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.
   1. SPDs with EMI/RFI filter: Include noise attenuation performance.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:
   1. UL 1449.
   2. UL 1283 (for Type 2 SPDs).

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual connections and locations of surge protective devices.

1.08 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.09 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.10 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.11 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Field-installed, Externally Mounted Surge Protective Devices:
   1. Advanced Protection Technologies, Inc (APT): www.aptsurge.com.
   2. Current Technology; a brand of Thomas & Betts Power Solutions: www.tnbpowersolutions.com.
   3. General Electric Company: www.geindustrial.com.
   4. Schneider Electric; Square D Brand Surgelogic Products; _____: www.surgelogic.com.

B. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.

C. UL 1449 Voltage Protection Ratings (VPRs):

1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.

D. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

E. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
1. Indoor clean, dry locations: Type 1.
2. Outdoor locations: Type 3R.

F. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.
2. Provide flush-mounted SPD where mounted in public areas or adjacent to flush-mounted equipment.

G. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
1. Switchboards: See Section 26 24 13.

2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS

A. Unless otherwise indicated, provide factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

D. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.

E. Repetitive Surge Current Capacity: Not less than 5,000 impulses.

F. UL 1449 Nominal Discharge Current (I-n): 20 kA.

G. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

H. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
1. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

I. Diagnostics:
1. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

J. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Unless otherwise indicated, provide field-installed, externally mounted or factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 or Type 2.

C. Distribution locations include SPDs connected to distribution panelboards.

D. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

E. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.

F. Repetitive Surge Current Capacity: Not less than 3,500 impulses.

G. UL 1449 Nominal Discharge Current (I-n): 20 kA.

H. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

I. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
   1. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.

J. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
   2. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of the drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 26 05 26, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.

B. Install SPD in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

E. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.

F. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

G. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

H. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Section 7.19.1.

D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Lamps.

F. Luminaire accessories.

1.03 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.

B. Section 26 09 23 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, time switches, and outdoor photo controls.

C. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

D. Section 26 56 00 - Exterior Lighting.

1.04 REFERENCE STANDARDS

A. ANSI C78.379 - American National Standard for Electric Lamps -- Reflector Lamps -- Classification of Beam Patterns; 2006.

B. ANSI C82.1 - American National Standard for Lamp Ballast - Line Frequency Fluorescent Lamp Ballast; 2004.

C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. NFPA 101 - Life Safety Code; 2015.

L. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

M. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

N. UL 1598 - Luminaires; Current Edition, Including All Revisions.

O. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

F. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

C. Provide five year pro-rata warranty for batteries for emergency lighting units.

D. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

1.11 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Furnish two of each plastic lens type.

PART 2 PRODUCTS

2.01 MANUFACTURERS - LUMINAIRES

A. Substitutions: See Section 01 60 00 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

2.02 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

2.03 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products that comply with requirements of NFPA 70 and NFPA 101.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Provide products complying with Federal Energy Management Program (FEMP) requirements.

F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

I. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

J. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.

K. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

L. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.04 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Sealed maintenance-free lead calcium unless otherwise indicated.
   2. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

F. Accessories:
   1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
   2. Provide compatible accessory wire guards where indicated.
   3. Where indicated, provide emergency remote heads that are compatible with the emergency lighting unit they are connected to and suitable for the installed location.

2.05 EXIT SIGNS

A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

B. Self-Powered Exit Signs:
   1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
   2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
   3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
   4. Provide low-voltage disconnect to prevent battery damage from deep discharge.

C. Accessories:
   1. Provide compatible accessory wire guards where indicated.
   2. Directional Arrows: Universal type for field adjustment.
   3. Mounting: As indicated.

2.06 BALLASTS AND DRIVERS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Lutron Electronics Company, Inc; www.lutron.com.
   3. Osram Sylvania: www.sylvania.com.
   4. Philips Lighting Electronics/Advance: www.advance.philips.com.
   5. Substitutions: See Section 01 60 00 - Product Requirements.
   6. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
   7. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.07 LAMPS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Osram Sylvania: www.sylvania.com.
   3. Philips Lighting Company: www.lighting.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.

B. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect Engineer to be inconsistent in perceived color temperature.

2.08 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Suspended Ceiling Mounted Luminaires:
   1. Do not use ceiling tiles to bear weight of luminaires.
   2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
   3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
   4. Secure pendant-mounted luminaires to building structure.
   5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
   6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
   7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
   2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
   3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

G. Suspended Luminaires:
   1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
   2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
   3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
   4. Install canopies tight to mounting surface.
   5. Unless otherwise indicated, support pendants from swivel hangers.

H. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

I. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).

J. Install accessories furnished with each luminaire.

K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.

L. Bond products and metal accessories to branch circuit equipment grounding conductor.

M. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

N. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

O. Remote Ballasts: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection in accordance with Section 01 40 00.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.

F. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect Engineer.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect Engineer. Secure locking fittings in place.

B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect Engineer or authority having jurisdiction.

C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect Engineer or authority having jurisdiction.

D. Aim and adjust fixtures as indicated.

E. Position exit sign directional arrows as indicated.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosures.

D. Clean finishes and touch up damage.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect Engineer, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

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SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Lamps.

D. Luminaire accessories.

1.03 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.

B. Section 26 09 23 - Lighting Control Devices: Automatic controls for lighting including time switches and outdoor photo controls.

C. Section 26 51 00 - Interior Lighting.

1.04 REFERENCE STANDARDS

A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.

B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.

G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.

J. UL 1598 - Luminaires; Current Edition, Including All Revisions.

K. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Notify Architect Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution.
   3. Provide structural calculations for each pole proposed for substitution.

4. Detail equipment drawings indicating dimensions, weights, loads, required clearances, assembly instructions, components, and location and size of each field connection.
5. Design calculations signed and sealed by an engineer licensed to practice in the state where the project is located for the design of the poles and foundation.
6. Wiring Diagrams: For power, signal, and control wiring.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Lamps: Include rated life and initial and mean lumen output.

D. Special Inspection Reports: For the foundation installation including the drilling of piers or subgrade of footings and installation of anchor bolts.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Lamps: One of each type and wattage.

H. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.07 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 (NEC).

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

C. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Store and handle poles and fixtures to prevent damage prior to installation..

1.09 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

B. Furnish two of each type and wattage lamp installed.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:
   1. Ceiling Compatibility: Comply with NEMA LE 4.
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

J. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

K. Exposed Hardware: Stainless steel.

2.03 BALLASTS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Osram Sylvania: www.sylvania.com.
   3. Philips Lighting Electronics/Advance: www.advance.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.
   5. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.

B. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. High Intensity Discharge (HID) Ballasts: Unless otherwise indicated, provide electromagnetic ballasts complying with ANSI C82.4 and listed and labeled as complying with UL 1029.
   1. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 5 percent.
   2. Power Factor: Not less than 0.90 unless otherwise indicated.
   3. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of -22 degrees F.

2.04 LAMPS

A. Manufacturers:
   1. General Electric Company/GE Lighting: www.gelighting.com.
   2. Osram Sylvania: www.sylvania.com.
   3. Philips Lighting Company: www.lighting.philips.com.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

5. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.

B. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect Engineer to be inconsistent in perceived color temperature.

C. High Intensity Discharge (HID) Lamps: Wattage as indicated, with bulb type, burning position, and base type as required for luminaire.
   1. Metal Halide Lamps:
      a. Non-Reflector Type Metal Halide Lamps: Clear lamp finish unless otherwise indicated.
      b. Ceramic Metal Halide Lamps:
         1) Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
         2) Color Rendering Index (CRI): Not less than 80.
   2. High Pressure Sodium Lamps:
      a. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
      b. Average Rated Life: Not less than 24,000 hours for an operating cycle of ten hours per start.

2.05 ACCESSORIES

A. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 LUMINAIRE INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.

2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.

F. Suspended Luminaires:
1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Install canopies tight to mounting surface.

G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Perform field inspection, testing, and adjusting in accordance with Section 01 40 00. Final inspection, testing and adjusting must be done at night.

D. Operate each luminaire after installation and connection to verify proper operation.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect Engineer.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect Engineer. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect Engineer.

C. Aim and adjust luminaires to provide illumination levels and distribution indicated on Drawings.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

B. Clean electrical parts to remove conductive and deleterious materials.

C. Remove dirt and debris from enclosure.

D. Clean photometric control surfaces as recommended by manufacturer.

E. Clean finishes and touch up damage.

3.07 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of luminaires to Architect Engineer, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

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SECTION 27 10 05

STRUCTURED CABLING FOR VOICE AND DATA - INSIDE-PLANT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
   1. Includes intersystem bonding termination.
   2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

C. Section 26 05 34 - Conduit.

D. Section 26 05 37 - Boxes.

E. Section 26 05 53 - Identification for Electrical Systems: Identification products.

F. Section 26 27 26 - Wiring Devices.

1.04 REFERENCE STANDARDS

A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.

B. ICEA S-83-596 - Indoor Optical Fiber Cables; Insulated Cable Engineers Association; 2011.

C. NECA/BICSI 568 - Standard for Installing Building Telecommunications Cabling; National Electrical Contractors Association; 2006.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 2012.

F. TIA-492CAAA - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers; 1998 (R 2002).

G. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; Telecommunications Industry Association; 2000 (R2005).

H. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant; Rev A, 2015.

I. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2015.

J. TIA-568-C.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; Rev C, 2009 (with Addenda; 2014).

K. TIA-568-C.3 - Optical Fiber Cabling Components Standard; Rev C, 2008 (with Addenda; 2011).

L. TIA-569-C - Commercial Building Standard for Telecommunications Pathways and Spaces; Rev C, 2012 (with Addenda; 2013).

M. TIA-598-C - Optical Fiber Cable Color Coding; Rev C, 2005.

N. TIA-606-B - Administration Standard for the Telecommunications Infrastructure; Rev B, 2012.

O. TIA-607-B - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; Rev B, 2012 (with Addenda; 2013).

P. UL 444 - Communications Cables; Current Edition, Including All Revisions.

Q. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

R. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

S. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

G. Field Test Reports.

H. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
   1. Employing a BICSI Registered Communications Distribution Designer (RCDD).

2. Supervisors and installers factory certified by manufacturers of products to be installed.
3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.
4. Certified in the Commscope Uniprise solution provided and be able to supply the manufacturers' system warranty, provide at least 3 references of similar size and scope within the K12 setting.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep stored products clean and dry.

1.09 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 20 year period after Date of Substantial Completion.

C. Long term 20 year warranty on all cable installations that includes material, workmanship and channel performance

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cabling and Equipment:
1. Commscope: www.commscope.com
2. Substitutions: See Section 01 60 00 - Product Requirements. Require approval by Buffalo Island Central (BIC) School District prior to bidding.

2.02 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
1. Comply with TIA-568 (SET) (cabling) and TIA-569-C (pathways), latest editions (commercial standards).
2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607-B and are UL listed or third party independent testing laboratory certified.
3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
1. Building Entrance Cable: Cabling by Ritter Communications, conduit pathway into building by contractor..
2. Backbones - Within Building: Fiber optic, Single mode-fiber.
3. Backbones - Between Buildings: Fiber optic, single mode-fiber.

C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
1. Locate intermediate distribution frames as indicated on the drawings.

D. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.03 PATHWAYS

A. Conduit: As specified in Section 26 05 34; provide pull cords in all conduit.

B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

2.04 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568-C.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Data and A/V drops: TIA-568-C.2 Category 6A UTP (unshielded twisted pair); 23 AWG.
   3. Cable Type - Voice, Intercom/Paging, and IP Camera drops: TIA-568-C.2 Category 6 UTP (unshielded twisted pair): 23 AWG.
   4. Cable Capacity: 4-pair.
   5. Cable Applications:
      a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
      b. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
   6. Cable Jacket Color -Wired Data Cable: Blue.
   7. Cable Jacket Color - Wireless Data: Green.
   8. Cable Jacket Color - Classroom A/V: Orange
   9. Cable Jacket Color - Voice Cable: White.
   10. Cable Jacket Color - Intercom/Paging: Gray.
   11. Cable Jacket Color - IP Cameras: Yellow
   12. Product(s):
      a. Commscope Uniprise Solutions
         1) Category 6A F/UTP Cable:
            (a) 10GN4 Blue Reel Part Number 8441604/10
            (b) 10GN4 Green Reel Part Number 884002004/10
            (c) 10GN4 Orange Reel Part Number 884001904/10
         2) Category 6 F/UTP:
            (a) 65N4+White CPK Part Number 8471714/10
            (b) 65N4+Yellow CPK Part Number 8471914/10
            (c) 65N4+Gray CPK Part Number 8471814/10

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
   3. Product(s):
      a. Commscope Uniprise Solutions
         1) RJ45 Jacks:
            (a) Cat 6A UNJ10G-Blue Part Number 760150011
            (b) Cat 6A UNJ10G-Green Part Number 760149963
            (c) Cat 6A UNJ10G-Orange Part Number 760149930
            (d) Cat 6 UNJ600-WH Part Number CC002083/1
            (e) Cat 6 UNJ600-YL Part Number CC0020842/1
            (f) Cat 6 UNJ600-GY Part Number CC0020891/1

2.05 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES

A. Fiber Optic Backbone Cable:

1. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568-C.3, TIA-598-C, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
2. Cable Type: Single-mode, 8.3/125 um (OS2) complying with TIA-492CAAB.
3. Cable Capacity: 24-fiber.
4. Cable Applications:
   a. Plenum Applications: Use listed NFPA 70 Type OFNP plenum cable.
   b. Riser Applications: Use listed NFPA 70 Type OFNR riser cable or Type OFNP plenum cable.
5. Product(s):
   a. Commscope Indoor/Outdoor LSZH Armored 24 Strand Single Mode Fiber Part Number 760134858.

B. Fiber Optic Interconnecting Devices:
1. Connector Type: Type LC.
2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.
4. Product(s):
   a. Commscope LC Qwik II TeraSPEED singlemode OS2, single Part Number 760117895.

2.06 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
   a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
   b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
   c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606-B.
   d. Provide incoming cable strain relief and routing guides on back of panel.
2. Product(s):
   a. Commscope
      1) Patch Panels:
         (a) 24 Port Modular Patch Panel - M2000-24-1U Part Number 760049932
         (b) 48 Port Modular Patch Panel - M2000-48-2U Part Number 760049940

B. Fiber Optic Cross-Connection Equipment:
1. Patch Panels for Fiber Optic Cabling: Sized to fit EIA/ECA-310 standard 19 inch wide equipment racks; 0.09 inch thick aluminum.
   a. Adapters: As specified above under FIBER OPTIC CABLE AND INTERCONNECTING DEVICES; maximum of 24 duplex adaptors per standard panel width.
   b. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606-B.
   c. Provide incoming cable strain relief and routing guides on back of panel.
   d. Provide rear cable management tray at least 8 inches deep with removable cover.
   e. Provide dust covers for unused adapters.
2. Product(s):
   a. Commscope LC Adapter Panel, Part Number 760148361.
   b. Commscope Rack Mount Fiber Enclosure - Accepts 6 PNL Type Panels, Part Number 760141447
   c. Commscope Rack Mount Fiber Enclosure - Accepts 3 PNL Type Panels, Part Number 760147439

C. Backboards: Interior grade plywood without voids, 3/4 inch thick; UL-labeled fire-retardant.
1. Size: As indicated on drawings.

2. Do not paint over UL label.

D. Equipment Racks and Cabinets: EIA/ECA-310 standard 19 inch wide component racks.
1. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
2. Locks: Keyed alike.
3. Product(s):
a. Pentair Hoffman ACCESSPLUS Double-Hinged, Type 1 26U Wall Mount Lockable Rack, Part Number EWMW482418
b. Commscope 24"H x 24"D with glass door and lock, Part Number CW12-PVV-24
c. Commscope 36"H x 24"D with glass door and lock, Part Number CW19-PVV-24
d. Commscope 48"H x 24"D with glass door and lock, Part Number CW26-PVV-24

2.07 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 05 37.
1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.

B. Wall Plates:
1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
a. Data Only Outlets: See Plans.
b. Combination Voice/Data Outlets: 2 ports.
4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 27 26.
5. Product(s):
a. Commscope
1) Flush-Mounted Faceplates:
(a) 2 Port - M12LE-262-WHITE, Part Number 108333063
(b) 4 Port - M14LE-262-WHITE, Part Number 108033162
(c) 2 Port - M12LE-246-IVORY, Part Number 108333055
(d) 4 Port - M14LE-246-IVORY, Part Number 108333154

2.08 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607-B.

B. Comply with Section 26 05 26.

2.09 IDENTIFICATION PRODUCTS

A. Comply with TIA-606-B.

B. Comply with Section 26 05 53.

2.10 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Factory test cables according to TIA-568.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569-C (pathways), TIA-607-B (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607-B and NFPA 70.

D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches from power conduits and cables and panelboards.
   3. 5 inches from fluorescent and high frequency lighting fixtures.
   4. 6 inches from flues, hot water pipes, and steam pipes.

B. Conduit, in Addition to Requirements of Section 26 05 34:
   1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
   2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
   3. Arrange conduit to provide no more than 100 feet between pull points.
   4. Do not use conduit bodies.
   5. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.

C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of telecommunications outlets provided under this section.
      a. Mounting Heights: Unless otherwise indicated, as follows:
         1) Telephone and Data Outlets: 18 inches above finished floor.
         2) Telephone Outlets for Side-Reach Wall-Mounted Telephones: 54 inches above finished floor to top of telephone.
         3) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches above finished floor to top of telephone.
      b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
      d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
      e. Locate outlet boxes so that wall plate does not span different building finishes.
      f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches.
   2. At Outlets - Copper: 12 inches.
   3. At Outlets - Optical Fiber: 39 inches.

C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
   3. Use T568B wiring configuration.

D. Fiber Optic Cabling:

1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
1. Install to plywood backboards only, unless otherwise indicated.
2. Mount so height of topmost panel does not exceed 78 inches above floor.

F. Identification:
1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
1. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
2. Single Mode Backbone: Perform tests in accordance with TIA-526-7.

F. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 27 51 24
INTERCOM SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall furnish and install all equipment including, but not limited to, outlet boxes, wiring, speakers, and all other necessary equipment to provide a complete operating system as indicated with the contract documents. Provide all necessary wall plates, specialty boxes, etc., not provided by others.

B. Class Connection™ ES with revision 5 or higher firmware, shall be considered as meeting all specifications and as the base bid. The specifying authority must approve alternate systems. Bidders proposing alternate systems shall provide all relative descriptive information, including catalog cuts, shop and working drawings, data sheets along with a demonstration of the proposed system. This information must be presented to the relative parties as to allow sufficient time to review all material. This should be accomplished at least 10 (ten) days prior to the bid date.

C. The intent of this specification is to maximize communications between the classroom and administrative areas while enhancing school safety and reducing maintenance and operational cost.

D. Under this specification, the system shall provide a complete Communication System for the Administrative, Classroom, Cafeteria, Library, and Common areas.

E. The Communication System shall provide distribution of intercom, overhead paging, emergency paging, class change time tones, emergency tones, program material and prerecorded WAV files for emergency messaging.

1.02 RESPONSIBILITIES

A. Contract documents are detailed only to the extent required to show design intent. It shall be understood and agreed upon by the Contractor that all work described herein shall be complete in every detail.

B. Furnish additional items not mentioned herein to meet requirements as specified without claim for additional payments. Items may include hardware, rack panels, appropriate connection blocks, and all other parts that are required for installation.

C. Labor furnished shall be trained and experienced in the proposed Valcom intercom/paging/bell system and 3CX VoIP telecommunication systems, and provide references of for integration of similar size and scope.

D. All equipment unless otherwise specified, shall be new, free from defects, and the best craftsmanship in its class.

E. All manufactured equipment shall be installed as recommended by the manufacturers, or as indicated in their published installation manual.

F. Furnish and install necessary equipment, backboxes, supports and enclosures.

G. Furnish and install all necessary wire.

H. Perform final programming of system and audio level adjustments.

I. Provide system documentation including equipment manuals and drawings.

J. Guarantee all equipment and components for their specified period from date of acceptance.

K. Provide information on system requirements to any Contractor responsible for supplying related materials for this system.

1.03 SUBMITTALS

A. Adhere to layout drawings of the communication system and all components, IP speakers should be used in all common areas (hallways, gymnasiums, cafaterias, and outdoor spaces)

as defined by Buffalo Island Central School District, classrooms will leverage Yealink SIP Phones utilizing multicast paging for classroom communications.

B. Submit data sheets on equipment provided.

1.04 QUALIFICATIONS

A. The Contractor shall be from an established and local company (within 50 miles of the site work is to be performed) providing solutions to the school market for a minimum of 3 (three) years with 3CX VoIP Telecom Siolutions and Valcom Sound experience and shall have factory trained technicians on staff.

B. The Contractor shall maintain an adequate parts inventory to perform necessary service and upgrades.

1.05 MAINTENANCE

A. The Contractor shall provide a 12 (twelve)-month guarantee of the installed system against defects in material and workmanship. All warranty material shall be provided at no expense to the Owner. Guarantee period shall begin on the date of acceptance by the Owner or Engineers.

1.06 PLEDGE OF QUALITY

A. The Contractor shall be an authorized integrator for the supplied equipment (both 3CX and Valcom) with full warranty privileges.

B. The Contractor must have attended the proposed equipment Manufacturer's Training Program.

C. The Contractor shall inventory the necessary parts in order to maintain and service the equipment being supplied. This equipment inventory level shall be in direct proportion to total systems installed as recommended by the manufacturer.

D. The Contractor shall provide complete drawings detailing all interconnections, panel wiring diagrams, and specification sheets upon request.

1.07 IN-SERVICE TRAINING

A. The Contractor shall furnish in-service training with the system. The sessions shall facilitate the training of personnel in operating classroom equipment, administrative equipment, program distribution, and user programming functions. System specific customized user manuals shall be provided at the time of training.

1.08 WIRING

A. Wiring shall be CAT6 Commscope Uniprise and in accordance with the Manufacturer's specifications. Wiring shall meet all local and state codes. All wiring shall be ground and short tested.

1.09 COMMUNICATION SYSTEM

A. The Communication System shall provide at least the following functions and features:
   1. Direct dialed, hands-free, two-way communication from all administrative telephones to any location equipped with a talkback speaker.
   2. Automatic gain control on intercom speech to assure constant talkback speech level.
   3. Capable of handling up at least 720 I/O points (seven hundred twenty). A point is defined as a call-in switch or a speaker output.
   4. System shall be modular in design and capable of expanding in increments of 48 points allowing for budget flexibility and expandability.
   5. The system shall be connected to a switched, multicast enabled network meeting the manufacturer's published guidelines. This connection shall be via a standard Ethernet RJ-45 jack and shall provide all system functionality across the LAN/WAN to remote cabinets housing remote station cards eliminating the need for individual peripherals to be wired back to the main system. All devices connected to these remote shelves (speakers, staff assist call buttons, etc.) shall provide the same capabilities as those connected directly to the MDF.
   6. System shall interface with a 3CX VoIP telephone system, thus allowing the school(s) to upgrade or replace their telephone system without suffering a requirement to replace, or

lose any feature of, their internal communications (intercom) system. Any system that limits system features based upon any selected telephone system, and/or is proprietary to one or only a few telephone systems shall not be acceptable.

7. System shall automatically sound a tone or play a pre-page WAV file over any loudspeaker connected for two-way communication to alert the classroom teacher that this two-way call has been established. This is intended to prevent unauthorized monitoring. A privacy tone must repeat every 15 (fifteen) seconds.
8. System shall provide the distribution of emergency announcement(s) from any authorized telephone to all areas furnished with a loudspeaker. Emergency announcements shall have the highest system priority.
9. System shall provide the distribution of general announcements from any administrative Yealink T48G telephone, Yealink staff telephone, or Yealink classroom telephone. The system shall be capable of providing all-call, group calls, multiple group call, or dial-on-the-fly page groups.
10. Classroom speakers shall be assignable to a minimum of 72 (seventy-two) audio paging/distribution groups.
11. System shall provide the ability to define at least 16 time tone schedules with a minimum of 255 events per schedule. Each scheduled event shall be capable of controlling WAV file distribution; user selected custom audio/voice phrases, audio from auxiliary sources or a relays for building control. Each scheduled audio event shall be distributable to at least 72 audio groups. The system shall feature the ability to automatically simultaneously operate 8 or more schedules per day, based upon the day of the week or calendar dates up to one year in advance. Schedule administration, modification and creation functions must be available through designated administration computers. Systems that do not allow the school to manage their own schedules via computer or do not offer calendar based scheduling up to one year in advance or require separate page and time groups shall not be acceptable.
12. Provide a minimum of a 4 digit numbering plan, thus allowing the classroom speaker and the classroom telephone to be the same architectural number.
13. Any classroom/area loudspeaker must have the flexibility to be programmed as a testing room. A testing room shall be excluded from receiving general announcements, class change tones, group announcements and program material. The testing room must receive emergency tones and announcements. The testing rooms may be reactivated to normal operation at any time by the administration staff as needed. As an option, testing rooms shall feature the ability to automatically reset to normal operation before start of class the next day.
14. Customized programming shall be stored in non-volatile memory and shall not be lost due to power failures.
15. Classroom initiated intercom calls must be assignable to ring at specific administrative ports. These administrative ports shall have the flexibility to be forwarded to other administrative ports should a call go unanswered or should the assigned administrative port be busy.
16. Facilities to annunciate incoming intercom calls at multiple administrative phones simultaneously. Once answered, the call will automatically be cancelled for other administrative phones.
17. System functionality must include the capability to manually distribute 60+ custom audio files via pushbuttons, contact closure, or dial code from administrative telephones. The tones shall be fully customizable.
18. The system must provide a minimum of 4 (four) ports to be connected to the telephone system from the intercom system. These 4 (four) intercom lines shall provide built-in Enhanced Caller Line Identification which will visually announce the name of the teacher or location and the classroom dial intercom code, and call priority level; thus allowing interface to any telephone system. Systems that require integration to a specific telephone system or systems in order to offer this feature shall not be acceptable.
19. The system shall have the ability to control relays. Relays shall be controlled through administrative computers, DTMF controlled or automatically cycle on and off by schedules.

All relays must be programmable with the flexibility to change as required. A minimum of eight (8) relays shall be provided.

20. The system shall provide at least three simultaneously operating, non-restrictive program distribution channels. The audio program material shall be controlled and distributed through the administration computer thus allowing simple and easy changes. Systems that require manual operated switch-banks or cumbersome DTMF telephone codes for distribution shall not be acceptable
21. The system shall have the ability to store a minimum of 60 minutes of WAV files in a non-volatile manner.
    a. WAV files distribution shall feature programmable priority levels. They shall be programmable as to override any class change tones, normal all call, music, and intercom in the event of an emergency.
    b. The WAV files shall have the ability to be broadcast into any one or all of the audio groups within the system.
22. The WAV files shall be have the ability to be broadcast via a schedule for any day of the week or time of the day. They shall have the ability to broadcast for any duration of time and/or repeat.
23. The WAV files shall be able to be broadcast via a pushbutton selecting which WAV file is broadcast, the priority level, where it is broadcast, and how many times it shall play.
24. The WAV files shall have the ability to be utilized as class change tones within the system. These files shall be able to replace any tone within the class change schedules as to offer the flexibility of customizable tones and or phrases in this class change mode.

PART 2 - PRODUCTS

2.01 INTERCOM CONTROL UNIT

A. Shall be capable of expanding to a minimum of 720 (seven hundred twenty) points. A point is defined as a call-in switch or speaker output.

B. Provide pre-alert tone to classroom for intercom calls and general announcements.

C. Ability to program and control the built-in scheduler with unlimited events and unlimited time schedules with multiple audio groups.

D. Ability to control wireless or wired clocks (various correction methods).

E. Ability to produce user defined tone signals for time tones or emergency tones.

F. Ability to select the tone on an all call basis from any, or selected, administrative telephones.

G. Provide an Ethernet port, which will give ability to monitor operations and functions of the systems.

H. Provide off-site programming and diagnostics of the system. It shall also be capable of determining basic circuit faults.

I. The system shall be capable of simultaneous conversations between administrative ports.

J. System shall provide calendar based scheduling up to one year in advance.

K. The system shall be programmable via Ethernet connection.

L. System shall be capable of utilizing 45 (forty-five) ohm, IP based or 25-volt speakers for classroom type speakers.

M. Retrofit applications shall, where possible, reuse existing 25 volt speakers, call buttons and existing cabling. Substandard or defective speakers, call buttons and cabling shall be replaced on a per need basis.

N. New system speakers shall be capable of utilizing Commscope CAT6 UTP data wiring for installation, thus allowing for only one type of wiring infrastructure within the school. New systems that require infrastructure sized greater than 24 AWG shall not be acceptable.

O. Provide a minimum of 8 (eight) unrestricted simultaneous audio paths for communication between administrative phones, program material, time tone distribution, and paging. Systems that do not allow simultaneous pages to different paging groups will not be accepted.

P. Provide a minimum of 6 (six) programmable pushbutton inputs that can be used to activate tones or distribute program material.

Q. Provide a minimum of 8 (eight) programmable output contact closures which can be activated manually to turn on cameras, unlock doors, emergency lockdown, etc., or automatically based upon one or more schedules.

R. Provide a call confirmation tone at speaker when an intercom call is placed. This verifies that the call has been placed in queue.

S. Provide emergency voice messaging via the following methods:
   1. Any authorized PC on the schools LAN/WAN
   2. Any authorized telephone
   3. Any pushbutton
      a. System must have the capability to tie to a WAN to provide district wide all call paging as well as multi-building paging for the purposes of mass notification. Access to individual rooms for intercom purposes via the WAN must also be supported.

2.02 MASTER CLOCK

A. The intercom system shall provide a time base for the system secondary clocks. Systems requiring a separate master clock with a separate software package will not be accepted.

B. The intercom system shall have the ability to synchronize both analog and digital secondary clocks.

2.03 SPEAKERS/CALL SWITCHES

A. Ceiling speakers shall be 2'x2' Lay in style and shall consist of a white perforated grille, a speaker and integral backbox. The speaker cone shall be 8" in Diameter and have a minimum 5 oz magnet: The voice coil diameter shall be a minimum of ¾" and an impedance of 45 Ohms. The speaker shall produce a sound pressure level of 95 dB at 1 meter on axis with 1 watt applied. Frequency response shall be 80Hz to 15Khz. The baffle shall be constructed with a single piece of perforated steel with a white baked on acrylic enamel finish. The baffle shall be constructed with a single piece of perforated steel with a white baked on acrylic enamel finish. The backbox meets or exceeds A.S.T.M. E84 flame and smoke test and has a three-hour burn rating (UL181). Four seismic tabs provided for additional mounting integrity.

B. Wall speakers, including those within clock/speaker units, shall be 8" in Diameter and have a minimum 5 oz magnet: The Voice coil diameter shall be a minimum of ¾" and an impedance of 45 Ohms. The speaker shall produce a sound pressure level of 95 dB at 1 meter on axis with 1 watt applied. Frequency response shall be 80Hz to 15Khz.

C. Rooms requiring volume control of speakers shall have provisions for volume adjustment as part of the call switch assembly.

2.04 CLASSROOM AMPLIFICATION SYSTEM

A. The Connect Audio Management System shall include all components to properly amplify voice and other audio sources such as Media PC's, Projector/TV Audio, MP3 players, and any other audio source input. Wall or ceiling mounted speakers, infrared sensor, microphone/transmitter(s), chargers for microphones, and power shall all be included as part of each Class Connect system as specified by the district.

B. The Connect Audio Management System should be installed in all classrooms within the school which the district deems necessary.

C. Multiple speaker options shall include 8" ceiling speakers with bridge and backbox, 2'x2' lay in ceiling speakers, and/or wall speakers. All speakers shall include the hardware for proper mounting.

D. The Connect Audio Management System shall be fully interfaced to the existing or new intercom/paging system. The output of the intercom system shall directly interface to the Connect amplification system in the classroom. This integration shall give positive control when interfaced to the Class Connection Intercom System within the system as to cut off or duck all

sources within the classroom when an intercom or page announcement is made from anywhere within the school. Any systems that do not directly interface with the existing or new intercom/paging system shall not be acceptable.

E. The Connect Audio Management System shall be in wall, rack or shelf mounted anywhere within the classroom.

F. The infrared sensor shall be integrated with a speaker and shall utilize Commscope CAT6 wire for installation. COAX cable connection to infrared sensor is unacceptable.

G. Only two (2) speakers are necessary for larger common areas with average classroom sound levels and of average size. Additional speakers may be utilized if the room is above ambient average classroom noise levels or larger in size.

H. The Connect Amplification System shall include but not limited to the following components.
   1. Connect infrared receiver/amplifier/controller with two external recharging cradles.
   2. Four (4) Audio Inputs
   3. Two (2) Mic Inputs
   4. Two (2) volume controls (one for each mic)
   5. Four (4) audio volume controls (one for each input)
   6. Valcom LightMic microphone with rechargeable NiMH batteries
   7. Optional IR Handheld microphone with rechargeable NiMH batteries for student pass-around use.
   8. Built-In IR sensor on one of the speakers.
   9. Two (2) or Four (4) 8” ceiling, 2’x2’ lay in, or wall speakers with mounting hardware.
   10. Audio distortion: <1%

I. Acceptable Manufactures
   1. Valcom, 5614 Hollins Road, Roanoke, VA 24019.
   2. Substitutions must be fully compliant with all specifications as written. Bidders proposing alternate equipment must provide manufacturer data on all products including:
      a. Catalog Cut Sheets
      b. Installation Manual
      c. Typical wiring drawings

J. The microphone inputs shall have a class of service programming as to allow ducking or cut off of local auxiliary audio. The system shall also have dual connections for the paging system speakers as to allow one or both Classroom Amplification speakers to engage during an intercom page if required by the district.

K. The Classroom Amplification System shall have a low level output to connect to Valcom Self Amplified Speakers or other audio equipment if needed.

L. The Classroom Amplification System shall have an amplified output to connect to Valcom forty-five (45) ohm speakers.

M. The Classroom Amplification System shall either be shelf or in-wall mounted.

N. The Connect system shall have an emergency cut-off input that when interfaced to the fire alarm relay contact output shall turn SILENCE all audio devices within the room in the event of a fire as to help lower the overall decibels levels to help the students and staff hear the audible fire alarm tones/instructions within that room.

O. The master output volume control shall control all four (4) audio input sources. Each audio input shall also have a separate input level volume control as to adjust the gain for each independent audio source. The master volume control shall not affect the microphone level output.

P. System must have built-in automatic, self-adjusting DSP feedback rejection enhancement.

Q. Integrated microphone type: uni-directional electret
   1. Input jack for optional external microphone: 3.5mm
   2. Microphone input impedance: 2.2k ?
   3. Battery Charger input: 3.5mm DC jack

4. Cradle Charger: 3.5mm DC jack inputs; charges up to two V-IRM5
5. Battery Power: 2 AA NiMH Rechargeable Batteries
6. Dimensions: 1.375” (w) x 4.625” (l) x 1” (d)
7. Weight (with batteries): 3.7 oz.

R. EXTERNAL IR SENSOR (If required)
1. Power: from receiver/amplifier
2. Reception coverage: 360 degrees
3. Cable: 50 ? plenum-rated Coax (50 feet) with F-type connectors
4. Mounting: ceiling or wall mount (bracket included)
5. Diodes: 32

S. CONNECT AUDIO MANAGEMENT/AMPLIFIER SPECIFICATION
1. Power Output: 75dB@1 meter nominal
2. Frequency Response: 50Hz to 15Khz
3. Power Supply: 24VDc/500mA
4. Signal-to-noise:>73dB
5. Image and spurious Rejection: >70dB
6. Total Harmonic Distortion: <1%@ 4 watts
7. Speaker Load Impedance: 100 Ohms
8. Standard sub-carrier frequencies: 2.06MHz/2.54Mhz
9. Receiver sensitivity: 6uV for 60dB s/n
10. Reception selectivity: +/- 40 kHz
11. Dimensions (WxDxH): 5” x 2” x 3”

T. Controls and indicators
1. (2) IR microphone volume controls with ACTIVE LED indicator
2. (4) Auxiliary audio input volume controls
3. (1) Master output volume control
4. Bass and Treble controls
5. Power on LED

U. Connections:
1. (All connections use 4pr Commscope CAT6 twisted pair cable)
2. Speaker outputs (Line out and Amplified): Screw Terminals
3. Power input: Screw Terminals
4. (4) Auxiliary Inputs: 1/8 Phono Jacks / Screw Terminals
5. Intercom Input: Screw Terminals
6. IR sensor input Screw Terminals

V. SPEAKERS
1. 2’x2’ Lay in Speaker
    a. Cone Diameter: 8”
    b. Voice coil impedance: 45 Ohms
    c. Power Handling: 12 Watts
    d. Frequency response: 80Hz to 15Khz
    e. Steel housing with a white baked on acrylic enamel finish
        1) Wall Speaker
            (a) Cone Diameter: 8”
            (b) Voice coil impedance: 45 Ohms
            (c) Power Handling: 12 Watts
            (d) Frequency response: 80Hz to 15Khz
            (e) Gray Metal enamel fish with Black cloth grill
        2) Corner Speakers
            (a) Cone Diameter: 8”
            (b) Voice coil impedance: 45 Ohms
            (c) Power Handling: 12 Watts

(d) Frequency response: 80Hz to 15Khz
(e) Gray Metal enamel fish with Black cloth grill
(f) Degree dispersion angle

2.05 WIRING

A. All wiring shall be listed for the intended purpose. The intercom shall use Commscope CAT6 UTP listed cable.

B. All interior wiring shall be in accordance with new construction guidelines suggested by the Manufacturer; including the speaker and the call-in switch.

2.06 INSTALLATION

A. Complete system shall be installed in accordance with Manufacturer's recommendations.

B. All wiring shall be installed in raceways or plenum rated cable where routed in plenum ceiling areas.

2.07 PROTECTION

A. The contractor shall note in his system drawings, the type of protection devices and all relative information.

B. The contractor shall provide all necessary protection on the AC power feed and on all station lines leaving/entering the building.

END OF SECTION

SECTION 28 13 00
ACCESS CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Access control devices.

1.03 REFERENCES

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Provide system wiring diagram showing each device and wiring connection required.

C. Product Data: Provide electrical characteristics and connection requirements.

D. Test Reports: Indicate satisfactory completion of required tests and inspections.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of access authorization equipment.

G. Operation Data: Operating instructions.

H. Maintenance Data: Maintenance and repair procedures.

PART 2 PRODUCTS

2.01 ACCESS CONTROL SYSTEM

A. Access Control System: Control access to building using encoded cards:

2.02 COMPONENTS

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use 14 AWG minimum size conductors for detection and signal circuit conductors. Install wiring in conduit.

C. Make conduit and wiring connections to door hardware devices furnished and installed under Section 08 71 00.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Manufacturer Services: Furnish services of technician to supervise installation, adjustments, final connections, system testing, and to train Owner personnel.

3.03 CLOSEOUT ACTIVITIES

A. Demonstrate normal and abnormal modes of operation, and required response to each.

B. Provide 8 hours of instruction each for two persons.
   1. Conduct instruction at project site with manufacturer's representative.

3.04 MAINTENANCE

A. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Furnish service and maintenance of security access system for one year from Date of Substantial Completion.

END OF SECTION

SECTION 28 23 00
VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Video surveillance system requirements.

B. Video recording and viewing equipment.

C. Cameras.

D. Accessories.

1.03 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 34 - Conduit.

D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

E. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Data cables for IP video surveillance system network connections.

1.04 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

B. NECA 303 - Standard for Installing Closed-Circuit Television (CCTV) Systems; 2005.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
   3. Notify Architect Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meetings:
   1. Conduct meeting with facility representative to review camera and equipment locations and camera field of view objectives.
   2. Conduct meeting with facility representative and other related equipment manufacturers to discuss video surveillance system interface requirements.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

D. Design Data:
   1. Standby battery/UPS calculations.
   2. Video storage capacity calculations.

E. Certify that proposed system design and components meet or exceed specified requirements.

F. Evidence of qualifications for installer.

G. Evidence of qualifications for maintenance contractor (if different entity from installer).

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

I. Manufacturer’s detailed field testing procedures.

J. Field quality control test reports.

K. Project Record Documents: Record actual locations of system components and installed wiring arrangements and routing.

L. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

M. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

N. Maintenance contracts.

O. Software: One copy of software not resident in read-only memory.

1.07 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70
   2. Applicable TIA/EIA standards.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with video surveillance systems of similar size, type, and complexity and providing contract maintenance service as a regular part of their business; authorized manufacturer's representative.
   1. Contract maintenance office located within 100 miles of project site.

D. Maintenance Contractor Qualifications: Same entity as installer.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 303.

B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Video Recording and Viewing Equipment - Basis of Design: _____.

B. Substitutions: See Section 01 60 00 - Product Requirements.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

D. Source Limitations: Where possible, furnish system components and accessories produced by a single manufacturer and obtained from a single supplier.

2.02 VIDEO SURVEILLANCE SYSTEM

A. Provide new video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. System Description: IP system with connection to network (IP) cameras.
   1. Video Storage Capacity: Suitable for storing video from all cameras for 14 days.
   2. System Battery Backup: Provide batteries/uninterruptible power supplies (UPS) as required for _____ minutes full operation.
   3. Surge Protection:
      a. Provide surge protection for exterior cameras .
      b. Provide equipment power surge protection where electrical distribution system surge protection is not provided.

C. Cameras Required:
   1. See article "CAMERAS" below for product descriptions.

D. Video Recording and Viewing Equipment Required:
   1. See article "VIDEO RECORDING AND VIEWING EQUIPMENT" below for product descriptions.

E. Interface with Other Systems:
   1. Provide products compatible with other systems requiring interface with video surveillance system.

F. Provide products listed, classified, and labeled as suitable for the purpose intended.

G. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 15, for Class B, consumer application.

2.03 VIDEO RECORDING AND VIEWING EQUIPMENT

A. Provide video recording and viewing equipment compatible with cameras to be connected.

B. Network Video Recorders (NVRs):
   1. Supports connection of network (IP) cameras.
   2. Supports continuous and event-based recording.

C. Hybrid Digital Video Recorders (DVRs):
   1. Supports connection of both network (IP) and analog cameras.
   2. Supports continuous and event-based recording.

D. Computers:
   1. Workstation Computers: Unless otherwise indicated, workstation computer hardware not furnished by video surveillance system manufacturer to be provided by Contractor as part of work of this section, meeting video surveillance system equipment manufacturer's minimum requirements.
   2. Servers: Unless otherwise indicated, server hardware not furnished by video surveillance system manufacturer to be provided by Contractor as part of work of this section, meeting video surveillance system equipment manufacturer's minimum requirements.

E. Software:
   1. Unless otherwise indicated, provide all software and licenses required for fully operational system.

F. Monitors:
   1. Unless otherwise indicated, monitors to be provided by Contractor as part of work of this section.

2.04 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Network (IP) Cameras:
   1. Signal-to-Noise Ratio: Not less than 50 dB.
   2. Provide the following standard features:
      a. Automatic electronic shutter.
      b. Automatic gain control.
      c. Automatic white balance.
      d. Web-based interface for remote viewing and setup.
      e. Password protected security access.

D. Lenses:
   1. Where not factory-installed, provide lenses matched to cameras and the intended application.

E. Camera Enclosures and Mounting Brackets:
   1. Where not factory-installed, provide accessory camera enclosures suitable for operation under the service conditions at the installed location.
   2. Where not factory-installed, provide accessory camera mounting brackets necessary for installation.

2.05 ACCESSORIES

A. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

B. Provide network switches as required for network connections to system components.

C. Provide accessory controllers as indicated or as required for operator control.

D. Provide cables as indicated or as required for connections between system components.
   1. Data Cables for IP Network Connections: Unshielded twisted pair (UTP), minimum Category 5e, complying with Section 27 10 05.

E. Provide accessory racks/cabinets as indicated or as required for equipment mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 26 05 29.

D. Wiring Method: Unless otherwise indicated, use wiring in conduit.
   1. Use suitable listed cables in wet locations, including underground raceways.
   2. Use suitable listed cables for vertical riser applications.
   3. Conduit: Comply with Section 26 05 34.

E. Provide grounding and bonding in accordance with Section 26 05 26.

F. Identify system wiring and components in accordance with Section 26 05 53.

3.03 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.

C. Prepare and start system in accordance with manufacturer's instructions.

D. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

E. Program system parameters according to requirements of Owner.

F. Test for proper interface with other systems.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

H. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of four hours of training.
   3. Instructor: Manufacturer's authorized representative.
   4. Location: At project site.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

3.07 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of video surveillance system for two years from date of

Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

C. Conduct site visit at least once every three months to perform inspection, testing, and preventive maintenance. Submit report to Owner indicating maintenance performed along with evaluations and recommendations.

D. Provide trouble call-back service upon notification by Owner:
   1. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

1.03 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.

B. Section 08 71 00 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.

C. Section 21 13 00 - Fire Suppression Sprinklers: Supervisory, alarm, and actuating devices installed in sprinkler system.

D. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

D. NFPA 3 - Recommended Practice for Commissioning of Fire Protection and Life Safety Systems; 2015.

E. NFPA 4 - Standard for Integrated Fire Protection and Life Safety System Testing; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with the contract documents.
   4. Proposed maintenance contract.

C. Drawings must be prepared using AutoCAD Release 2002 or newer.

D. Evidence of designer qualifications.

E. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction as well as compliance with contract documents, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Shop Drawings:

a. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A.14.6.2.4, and complete listing of software required.
b. System zone boundaries and interfaces to fire safety systems.
c. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.Plans shall show the addess for addessable devices.
d. Circuit and conduit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
1) Calculation method shall be shown including wire size and values used.
2) Calculation shall be Lump Sum at the end of the circuit or Point to Point. Load Centering shall not be used.
e. List of all devices on each signaling line circuit, with spare capacity indicated.

4. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
a. Information to include: Model numbers, listing, ratings, and power requirements.
b. Product cut sheets, calculations, certificates, etc. shall be submitted in a bound format or a single electronic document (such as PDF), shall be tabbed in a logical manner, and shall contain the information indicated.
c. Voltage Drop Calculations - Duplicate on drawings
1) Use methods specified in NFPA 72.
2) Voltage drop calculations shall start at 85% of nominal voltage, i.e. a 24VDC system shall be calculated as starting at 20.4VDC.
3) Circuit voltage not to drop below 16 VDC or the UL listed minimum voltage for device powered, whichever is higher.
4) Device current to be based on UL listed minimum voltage.
5) Circuit resistance shall include wire length out to last device and back to panel, including elevation changes.
6) Calculation method shall be shown including wire size and values used.
7) Calculation shall be Lump Sum at the end of the circuit or Point to Point. Load Centering shall not be used.
d. Battery calculations - Duplicate on drawings
1) Use methods specified in NFPA 72.
2) A minimum 20% safety factor to the calculated Amp-Hours shall be provided.

5. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
6. Certification by the manufacturer of the control unit that the system design complies with the contract documents.
7. Certification by Contractor that the system design complies with the contract documents.
8. Incomplete submittals or submittals that do not comply with these specifications may be rejected without a review.

F. Evidence of installer qualifications.

G. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

H. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.

5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

I. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with his installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

K. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
3. In addition to the items in quantities indicated in PART 2, furnish the following:
   a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
   b. One copy, on CD-ROM and one copy on USB flash drive, of all software not resident in read-only-memory.

1.06 QUALITY ASSURANCE

A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
   a. Demonstrated qualifications through written assessment of at least NICET level II, or AE approved equivalent. This includes individuals installing conduit, boxes, or wire for fire alarm devices.
3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
4. Contract maintenance office located within 100 miles of project site.

5. Certified in the State of Arkansas as fire alarm installer.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units - Basis of Design: Honeywell Security & Fire Solutions/Gamewell-FCI ; _____: www.gamewell-fci.com.

B. Fire Alarm Control Units - Other Acceptable Manufacturers: Provided their products meet or exceed the performance of the basis of design product, products of the following are acceptable:
1. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com.
2. Honeywell Security & Fire Solutions/Notifier: www.notifier.com.
3. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com.
4. Honeywell Security & Fire Solutions/Vista: www.security.honeywell.com.
5. Siemens Building Technologies, Inc: www.usa.siemens.com.
6. Provide all control units made by the same manufacturer.

C. Initiating Devices, and Notification Appliances:
1. System Sensor.
2. Same manufacturer as control units.

D. Substitutions: See Section 01 60 00 - Product Requirements.
1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with contract documents.
2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with contract documents.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
1. Provide all components necessary, regardless of whether shown in the contract documents or not.
2. Provide all labor to complete required work.
3. Protected Premises: Entire building shown on drawings.
4. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
   a. ADA Standards.
   b. The requirements of the State Fire Marshal.
   c. The requirements of the local authority having jurisdiction.
   d. Applicable local codes.
   e. The contract documents (drawings and specifications).

f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

5. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.
6. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
7. Program notification zones and voice messages as directed by Owner.
8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
   a. This shall include, but not be limited to, all public restrooms, break rooms, exam rooms, fitting rooms, work rooms, conference rooms, open office areas, and corridors.
9. Master Control Unit (Panel): New, located at Riser Room.

B. Supervising Stations and Fire Department Connections:
1. Public Fire Department Notification: By on-premises supervising station.
2. Remote Supervising Station: UL-listed central station under contract to facility.
3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
4. Auxiliary Connection Type: Local energy.

C. Circuits:
1. Signaling Line Circuits (SLC): Class B.
2. Signaling Line Circuits (SLC) Between Buildings: Class A.
3. Notification Appliance Circuits (NAC): Class B.

D. Spare Capacity:
1. Notification Appliance Circuits: Minimum 25 percent spare capacity.
2. Speaker Amplifiers: Minimum 25 percent spare capacity.
3. Master Control Unit: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Unless noted otherwise on the plans, power booster panels (NAC) shall not be fed from a separate notification power booster panel (daisy chained). Each NAC shall be triggered by a SLC circuit.

F. Guards for Protection of Components
1. Description: Welded wire mesh or polycarbonate of size and shape for the manual station, smoke detector, strobe, or other device requiring protection.
   a. Factory fabricated and furnished by manufacturer of the device.
   b. Finish: Clear, or paint of color to match the protected device.
   c. Listed components of Safety Technology International Incorporated may be used with applicable de-ratings for strobes, horns, etc.

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
1. Sprinkler water control valves.
2. Duct smoke detectors.
3. Door hold-open smoke detectors.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Kitchen hood suppression activation; also disconnect fuel source from cooking equipment.
3. Smoke Detector(s)
4. Heat Detector(s)

5. Manual Pull Stations

C. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

D. Doors:
1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.
2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from.

2.04 COMPONENTS

A. General:
1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
3. Provide legible, permanent labels for each addressable device, using address used in control panel.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Remote Annunciators: LED at building entrance.

E. Initiating Devices:
1. Manual Pull Stations: Double-Action with Tamper-Resistant Cover.
a. Provide 1 extra.
2. Smoke Detectors: Photoelectric.
a. Provide 1 extra.
3. Duct Smoke Detectors: Photoelectric.
a. Provide 1 extra.

F. Notification Appliances:
1. Bells: Red Enamel.
2. Speakers: White Trim.
a. Provide 1 extra.
3. Speaker/Strobes White Trim Clear Strobe.
a. Selectable candela with candela visible when installed.
b. Provide 5 extra.
4. Strobes: White Trim Clear Strobe.
a. Selectable candela with candela visible when installed.
b. Provide 3 extra.

G. Conduit:
1. Install all wiring in a conduit or raceway. Conduit fill shall not exceed 40 percent of the interior cross sectional area where three or more cables are included within a single conduit.
2. Install conduit in accordance with the National Electrical Code, NFPA 70.
3. Conduit shall be 3/4 inch minimum.
4. Wiring for low voltage control, alarm notification, emergency communication, and similar power-limited auxiliary functions may be installed in the same conduit as initiating and signaling line circuits. Design system to permit simultaneous operation of all circuits without interference or loss of signals.
5. Fire Alarm Conduit: All fire alarm wiring shall be in hot-galvanized electric metalic tubing colored RED from the factory.
a. Junction covers shall be painted red and labeled "Fire Alarm".

b. Fire alarm conduit shall have the wording "Fire Alarm" factory stamped onto each 10' section of conduit. If conduit is to be exposed in a finished area, see criteria below.
c. If conduit is to be ran in an area with finished exposed ceiling spaces, consult with architect engineer for appropriate conduit and junction box color to match other equipment.

6. Conduits shall not enter the control panel or any other component provided except where entry is specified by the manufacturer.

H. Wire:
1. All fire alarm system wiring shall be new.
2. Wiring shall comply with local, state, and national codes and as recommended by the manufacturer. Number and size of conductors shall be as recommended by the manufacturer, but shall be not less than 18 AWG for initiating device and signaling line circuits, and 16 AWG for notification appliance circuits.
3. All wiring and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. FPLP red cable shall be used for all interior fire alarm circuits including that in conduit.
5. Any wire that goes underground, such as to PIV switches or to other buildings, shall be listed and approved for wet locations in accordance with NFPA 70.
6. All field wiring shall be supervised for open circuits, short circuits, and grounded conditions.

I. Control Panel: Connected to a separate dedicated branch circuit with a separate dedicated disconnect switch; circuit labeled FIRE ALARM.

J. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

K. Wiring runs shall be tested for continuity, short circuits and grounds before any system devices are installed or energized.

L. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.

M. Locks and Keys: Deliver keys to Owner.
1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

N. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
2. Provide one for each control unit where operations are to be performed.
3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
4. Provide extra copy with operation and maintenance data submittal.

O. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
1. Locate as directed by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. The contractor is responsible for testing all components in accordance with the manufacturers required and suggested procedures and in accordance with NFPA 72. If this specification incorporates a detailed Acceptance Test Procedure (ATP) prepared by the engineer than it shall also be followed.

B. Every fire alarm system shall be pre-tested by the contractor prior to scheduleing any inspections by the architect engineer, owner, or local jurisdictions. Testing shall comply with this section and NFPA 72.

C. Notify Owner 7 days prior to beginning completion inspections and tests.

D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
   1. A signed Record of Completion shall be provided to the inspector prior to their inspection.

E. Provide the service of a competent, factory-trained technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

F. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

G. Provide all tools, software, and supplies required to accomplish inspection and testing.

H. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

I. All smoke detectors shall be tested using canned smoke, or other approved method that will functionally test the smoke chamber. The use of magnets to commission smoke detectors is strictly prohibited.

J. Smoke detectors shall not be installed until the construction cleanup of all trades is complete per NFPA 72 and this section.
   1. Orange shipping covers, rubber gloves, tape, or other devices shall not be used to try and get around these basic requirements.
   2. Smoke detectors installed before the clean-up of all other dust or particle producing trades and without prior written approval of the engineer and local AHJ shall be replaced at the sole expense of the installing contractor.
   3. AE reserves the right to permanantly and indelibly mark any detector installed this way.
   4. Contractor is urged to use marked, temporary detectors for pre-testing of system and replace with new detectors prior to final testing.

K. All new smoke detectors that show to be "Dirty" through system sensitivity shall be replaced.

L. Audibility testing shall not be conducted until all doors, windows, walls, ceilings, and carpeting are in place. Final audibility testing that does not affect speaker placement should be done after space is fully furnished.

M. At a minimum the following tests shall be conducted, documented and given to AE at closeout:
   1. Open initiating device circuits and verify that the trouble signal actuates.
   2. Open and short signaling line circuits and verify that the trouble signal actuates.
   3. Open and short Notification Appliance Circuits and verify that trouble signal actuates.
   4. Ground all circuits and verify response of trouble signals.
   5. Check presence and audibility of tone throughout building spaces. This includes measuring dBA levels.
      a. A minimum of 15 dBA above ambient shall be obtained in every occupiable space (throughout) per NFPA 72. This includes storage rooms, electrical rooms, telephone rooms, and any other occupiable space.

6.
7. Each of the alarm, trouble, or supervisory conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
8. Each notification circuit shall be tested under standby power. End-of-line voltage readings shall be taken at the end-of-line resistor for Class “B” circuits, or at the booster panel for Class “A” circuits. Circuit voltage drop shall be recorded and compared to calculated voltage drop. Note: Some systems incorporating synchronizing modules can impair results. If the module cannot be bypassed for voltage readings, the manufacturer should be contacted for guidance.
9. System off-site reporting shall be verified for alarm, supervisory, trouble, correct address, facility name, contact phone number, and contact name.
10. When the system is equipped with optional features or connected to external, non-fire devices, the manufacturer's manual should be consulted to determine the proper testing procedures.

N. The commissioning inspector shall use the system record drawings and other documents specified under this specification during the testing procedure to verify operation as programmed. In conducting the commissioning test, the inspector shall request demonstration of any or all input and output functions.

O. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

P. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
1. Record all system operations and malfunctions.
2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
3. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
1. Hands-On Instruction: On-site, using operational system.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
1. Initial Training: 1 session pre-closeout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
1. Initial Training: 1 session pre-closeout.

D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
1. Be prepared to conduct any of the required tests.
2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
1. Approved operating and maintenance data has been delivered.

2. Spare parts, extra materials, and tools have been delivered.
3. All aspects of operation have been demonstrated to Owner.
4. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
5. Specified pre-closeout instruction is complete.

3.05 MAINTENANCE

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, a proposal as an alternate to the base bid, for a maintenance contract for entire warranty period, to include the work described below; include the total cost of contract, proposal to be valid at least until 30 days after date of Substantial Completion.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.03 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 57 13 - Temporary Erosion and Sediment Control.

D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

E. Section 31 22 00 - Grading: Topsoil removal.

F. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

PART 2 PRODUCTS

2.01 MATERIALS - NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 70 00 - Execution and Closeout Requirements.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.
   2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.

C. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

D. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures and building pads.

C. Finish grading .

1.03 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 23 - Fill: Filling and compaction.

1.04 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.05 QUALITY ASSURANCE

A. Employ services of a Geotechnical Consultant, approved by Architect Engineer, for the following services:
   1. Develop stripping techniques best suitable to site conditions at the time of construction.
   2. Review and advise on size of earthmoving equipment. Verify that soils on Site will not lose strength during earthmoving operations.
   3. Observe site grading.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 23 23.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

F. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

G. Protect plants, lawns, and other features to remain as a portion of final landscaping.

3.03 ROUGH GRADING

A. Remove subsoil and topsoil from areas to be filled or further excavated to a depth of 6", without mixing with foreign materials. Separate subsoil from topsoil.

B. Do not remove topsoil when wet.

C. When excavating through roots, perform work by hand and cut roots with sharp axe.

D. See Section 31 23 23 for filling procedures.

3.04 SOIL REMOVAL

A. Stockpile excavated topsoil on site.

B. Stockpile excavated subsoil on site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 FINISH GRADING

A. Before Finish Grading:
   1. Verify building and trench backfilling have been inspected.
   2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. Where topsoil is to be placed, scarify surface to depth of 3 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

E. Place topsoil to the following compacted thicknesses:
   1. Areas to be Seeded or Sodded: 4 inches.

F. Place topsoil during dry weather.

G. Remove roots, weeds, rocks, and foreign material while spreading.

H. Near plants spread topsoil manually to prevent damage.

I. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

J. Lightly compact placed topsoil.

3.06 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect Engineer as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

3.09 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile areas to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Excavating for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

1.03 RELATED REQUIREMENTS

A. Document 00 31 00 - Available Information: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 57 13 - Temporary Erosion and Sedimentation Control: Slope protection and erosion control.

C. Section 01 40 00 - Quality Requirements: Qualifications for Geotechnical Consultant.

D. Section 01 70 00 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.

E. Section 31 22 00 - Grading: Soil removal from surface of site.

F. Section 31 22 00 - Grading: Grading.

G. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

H. Section 31 23 23 - Fill: Fill materials, filling, and compacting.

1.04 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for excavation.

1.05 QUALITY ASSURANCE

A. Employ services of a Geotechnical Consultant, approved by Architect Engineer for the following services:
   1. Determine equipment sizes, and develop excavation, proof-rolling, undercutting, filling, and compaction techniques best suitable to site conditions at the time of construction.
   2. Observe the site excavation.
   3. Perform applicable laboratory and field tests.
   4. Provide professional judgment in determining the limits of undercutting. This judgment shall be to the satisfaction of Architect Engineer.
   5. Inspect bottom of individual and continuous footings. For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect Engineer.

1.06 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Review size of earthmoving equipment with Geotechnical Consultant. Verify that the silty clay soils on the site will not lose strength during earthmoving operations.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 22 00 - Grading for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

3.03 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
   1. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

D. Comply with Occupational Safety and Health Administration (OSHA) Safety and Health Regulations for Construction, 29 CFR 1926, Subpart P - Excavations.

E. Frost Protection: When freezing temperature may be expected, do not excavate to the full depth indicated unless the footings or slabs are to be poured immediately after the excavation has been completed. If placing of concrete is delayed, protect the bottoms of excavations from frost until concrete is placed.

F. Shoring And Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross braces, in good serviceable condition.
   1. Establish requirements for trench shoring and bracing to comply with local codes, OSHA, and authorities having jurisdiction.
   2. Install and maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses in order to protect work, to insure safety to workmen and public, and to protect and maintain existing structures, footings, roadways, utilities, etc. adjacent thereto.
   3. Design and installation is the sole responsibility of the Contractor and shall be reviewed by a Registered Professional Engineer at the Contractor's expense.

G. Do not interfere with 45 degree bearing splay of foundations.

H. Cut utility trenches wide enough to allow inspection of installed utilities.

I. Hand trim excavations. Remove loose matter.

J. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23 - Fill.

K. Grade top perimeter of excavation to prevent surface water from draining into excavation.

L. Remove excavated material that is unsuitable for re-use from site.

M. Remove excess excavated material from site.

3.04 PROOF-ROLLING UNDER THE BUILDING AND PAVEMENTS

A. Following clearing, stripping, and/or excavating, all subgrade soils are to be proof-rolled under the supervision of Geotechnical Consultant with at least a 10 ton roller or similar mechanical compactor, to verify that any localized soft, compressible soils are detected. If soft or unstable soils are detected, Geotechnical Consultant, after obtaining approval from the Architect Engineer, shall determine the course of action.

B. Do not proof-roll wet subgrades; wait for subgrades to dry out.

C. Extra payment for removal of soft and unstable soil and replacement with structural fill in accordance with Section 31 23 16 - Excavation and Section 31 23 23 - Fill will be based on the "Unit Price" quoted by the Contractor.
   1. Extra payment shall be applied against the allowance established in the contract for the item: Undercutting. The portion of the allowance not used shall be credited to the Owner based on the same unit price quoted in the Contract Documents. Any additional undercutting required above the allowance established, shall be based on the same "Unit Price" quoted by the Contractor, but only after consultation with Geotechnical Consultant and approved by Architect Engineer.
   2. The undercut material shall be disposed of off the site and shall not be used for fill.
   3. Measurement for determining the extent of undercutting will be by the average end area method for the volume of excavated material below existing subgrade. A registered engineer or surveyor shall be engaged by Contractor to perform these measurements. The report of this surveyor shall be submitted to the Architect Engineerfor approval.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.06 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

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SECTION 31 23 23

FILL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.03 RELATED REQUIREMENTS

A. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

B. Section 31 22 00 - Grading: Site grading.

C. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

1.04 PRICE AND PAYMENT PROCEDURES

A. See Section 01 22 00 - Unit Prices, for general requirements applicable to unit prices for earthwork.

1.05 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.06 REFERENCE STANDARDS

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

B. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

C. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2010.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Proposed Fill Material: For each soil type proposed for use, include the following:
   1. Classification per ASTM D 2487-00, Plasticity Index (PI), and Liquid Limit (LL).
   2. Proctor tests results.

C. Fill Composition Test Reports: Results of laboratory tests on actual materials use

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.09 QUALITY ASSURANCE

A. Employ services of a Geotechnical Consultant, approved by Architect Engineer for the following services:
   1. Develop filling and compaction techniques best suitable to site conditions at the time of construction.

2. Observe site filling.
3. Analyze soil materials proposed to be used as fill.
4. Perform applicable laboratory and field tests.

B. Perform all testing work in accordance with the following:
   1. Fill Properties:
      a. Plasticity Index shall be determined as per ASTM D4318-00 "Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils".
      b. Sieve Analysis shall be as per ASTM D422-63(1998) "Standard Test Method for Particle-Size Analysis of Soils".
      c. Water Content Density Relationship shall be determined as per ASTM D 698 "Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (12,400 ft-lbf/ft3)"Standard Proctor Test.
      d. Relative density shall be determined as per ASTM D4253-00 "Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table".

C. Compacted fill that does not reach the required density may be rejected by Geotechnical Consultant with approval from Architect Engineer. Recompact the Work to the required density, or remove the material in the area(s) affected, and replace removed material with fill compacted to the required density.

1.10 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. Review size of earthmoving equipment with Geotechnical Consultant. Ensure that the silty clay soils on site will not lose strength during earthmoving operation

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Imported borrow or local borrow capable of forming a stable embankment and free of roots and other unsatisfactory debris.
   1. Do not use with 5 feet of building or pavement.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

B. Structural Fill: Imported borrow or local borrow.
   1. Graded.
   2. Natural soils free of debris, organic matter or other deleterious materials, and rocks larger than 2 inches
   3. Plasticity Index 20 or less; Liquid Limit 45 or less.

C. Concrete for Fill: As specified in Section 033000 (03300); compressive strength of 2500 psi.

D. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.

E. Topsoil: Friable loam; imported borrow or local borrow.
   1. Free of roots, rocks larger than 1 inch, subsoil, debris, large weeds and foreign matter.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 31 22 00 for additional requirements.

3.02 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.
   1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
   2. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 6 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Compaction Density Unless Otherwise Specified or Indicated:
   1. Load-bearing foundation surfaces: Fill with concrete.
   2. Under building, slabs-on-grade, and similar construction: Use structural fill, flush to required elevation. If fine grained soils are used, compact to minimum 95% of maximum dry density within 2% of optimum moisture content. If granular soils are used, compact to 70% of the relative density as determined by ASTM D 4253 and D 4254.
   3. Under pavements: Use structural fill, flush to required elevation. If fine grained soils are used, compact to minimum 95% of maximum dry density within optimum and minus 2% of optimum moisture content. If granular soils are used, compact to 70% of the relative density as determined by ASTM D 4253 and D 4254. The top 12 inches under pavements shall be compacted to a minimum of 100% of the standard Proctor maximum dry unit weight in the case of fine grained soils or a minimum of 75% of the relative density in the case of granular soils.
   4. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry density.

I. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FIELD QUALITY CONTROL

A. The contractor shall employ and pay for services of an independent testing agency to perform field quality control tests, as specified in Section 01 40 00.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests (General or Structural fill): One for each 2500 sq. ft. of lift.

E. Frequency of Tests (Trench fill) : One for every 200 lineal feet of trench per lift of fill in place.

3.05 PROTECTION AND MAINTENANCE

A. Protection Of Graded Areas: Protect newly graded areas from traffic, erosion, and effects of ponding of water. Keep free of trash and debris.
   1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
   2. Provide and maintain positive surface drainage to prevent ponding and subsequent saturation of excavation or fill materials. Saturated soils shall be removed and replaced or shall be dried to specified moisture content and recompacted without additional charge to Owner.

B. Reconditioning Compacted And/Or Excavated Areas: Where completed areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction. Failure of the disturbed soil to reach the required density, as evidenced by density tests, is cause for rejection by Geotechnical Consultant after obtaining approval from Architect Engineer of the work in the affected area(s). Remove and replace soils which cannot recompact to the required density.

C. Settling: Where settling is measurable or observable at fill areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.06 CLEANING

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 31 16
TERMITE CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Chemical soil treatment.

1.03 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; 1947 (Revised 2001).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Certificate of compliance from authority having jurisdiction indicating approval of toxicants.

E. Maintenance Data: Indicate re-treatment schedule .

F. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Approved by manufacturer of treatment materials.
   2. Licensed in the State of Arkansas.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five year installer's warranty against damage to building caused by termites.
   1. Include coverage for repairs to building and to contents damaged due to building damage. Repair damage and, if required, re-treat.
   2. Inspect annually and report in writing to Owner. Provide inspection service for 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MATERIALS

A. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

2.02 MIXES

A. Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. At Both Sides of Foundation Surface.
   3. Soil Within 10 feet of Building Perimeter For a Depth of 5 feet.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Aggregate base course.

B. Bituminous concrete paving.

1.03 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for paving and base.

B. Section 31 23 23 - Fill: Compacted subgrade for paving.

1.04 REFERENCE STANDARDS

A. Arkansas Highway and Transportation Department Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Latest Edition.

B. AI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types; 1997.

C. AASHTO T 180: Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in) Drop.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with State of Arkansas Highways standard.

B. Mixing Plant: Conform to State of Arkansas Highways standard.

C. Obtain materials from same source throughout.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

1.07 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Base Course: Class 7 aggregate base course in accordance with AHTD Standard Specifications for materials and workmanship.

B. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Asphalt Concrete Hot Mix Surface Course: Type II or III asphalt surface course in accordance with AHTD Standard Specifications for materials and workmanship.

B. Asphalt Concrete Hot Mix Binder Course: Type I asphalt binder course in accordance with AHTD Standard Specifications for materials and workmanship.

C. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 AGGREGATE BASE COURSE

A. Place on approved subgrade and compact base course in 8 inch maximum lifts to 98 percent of AASHTO T 180 maximum dry density per AHTD criteria.

3.03 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

C. Apply tack coat to contact surfaces of curbs, gutters and pavements.

D. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.04 PLACING ASPHALT PAVEMENT

A. Install Work in accordance with State of Arkansas Highways standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

E. Finished surface, when checked with a 10 foot straight edge placed perpendicular to the direction of slope, shall show no variation more than 1/8 inch. Unacceptable areas shall be removed and replaced at no expense to the owner.

F. Final pavement exhibiting surface defects such as poor texture, roller marks, honeycomb, cracking, rich marks, brown spots, bleeding, or waving shall be removed and replaced at no expence to the owner.

3.05 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.06 FIELD QUALITY CONTROL

A. The contractor shall employ and pay for services of an independent testing agency to perform field quality control tests, as specified in Section 01 40 00.

B. Evaluate aggregate base course compaction per AASHTO T 180. Frequency of tests: One for each 2500 sq. ft. of aggregate base course per lift.

C. Provide field inspection and testing of asphalt paving. Take samples and perform tests in accordance with AI MS-2.

3.07 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 14 days or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, and pavements.

1.03 RELATED REQUIREMENTS

A. Section 31 23 23 - Fill: Compacted subgrade for paving.

B. Section 32 12 16 - Asphalt Paving: Aggregate base course _____.

1.04 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

D. ACI 305R - Hot Weather Concreting; 2010.

E. ACI 306R - Cold Weather Concreting; 2010.

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

K. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

L. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

M. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

N. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

O. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

P. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

Q. ASTM D5893/D5893M - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements; 2010.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on joint filler, curing compound, admixtures, mix design, gradation, and other materials used in concrete mix.

C. Test Data: Provide field quality control test reports.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

A. Comply with applicable requirements of ACI 301.

2.02 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

2.03 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.

2.04 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Cement: ASTM C150/C150M Normal - Type I portland type, grey color.

C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.

D. Fly Ash: ASTM C618, Class C or F.

E. Water: Clean, and not detrimental to concrete.

F. Air-Entraining Admixtures: ASTM C260/C260M.

2.05 ACCESSORIES

A. Curing Compound: ASTM C309, Type 1, Class A.

B. Materials for sealing joints in the various paved areas indicated on the drawings shall be ASTM D 5893.

2.06 CONCRETE MIX DESIGN

A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect Engineer for preparing and reporting proposed mix designs.

B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

C. Concrete Properties:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3000 psi.
   2. Total Air Content: 6 percent plus or minus 1 percent, determined in accordance with ASTM C 173/C 173M.
   3. Maximum Slump: 3 inches.
   4. Maximum Aggregate Size: 3/4 inch.

2.07 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Notify Architect Engineer minimum 24 hours prior to commencement of concreting operations.

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

A. Place reinforcement as indicated.

B. Interrupt reinforcement at expansion joints.

C. Interrupt one-half of reinforcement at contraction joints.

3.05 COLD AND HOT WEATHER CONCRETING

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.06 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Do not place concrete when base surface is wet.

C. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.

D. Repair of Surface Defects: Immediately patch all repairable defective areas after form removal. If the repairs do not bring the Work into conformance, remove and re-pour.

3.07 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 1/2 inch wide expansion joints at 40 foot intervals, unless indicated otherwise, and to separate paving from vertical surfaces and other components.

C. Saw cut contraction joints 1/8 inch wide at intervals indicated at an optimum time after finishing. Cut 1/4 into depth of slab.

3.08 FINISHING

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Curbs and Gutters: Light broom, texture perpendicular to pavement direction.

D. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.09 JOINT SEALING

A. Sealing Joints: Immediately preceding, but not more than 50 feet ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 1/8 inch plus or minus 1/16 inch below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Architect/Engineer. When a primer is recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.10 JOINT SEALING INSPECTIONS

A. Joint Cleaning: Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of joint sealant.

B. Joint Sealant Application Equipment: The application equipment shall be inspected to ensure proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

C. Joint Sealant: The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Owner.

3.11 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.12 FIELD QUALITY CONTROL

A. The contractor shall employ services of an independent testing agency to perform field quality control tests, as specified in Section 01 40 00.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.
   2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
   3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
   1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
   2. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.13 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect/Engineer and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect/Engineer. The cost of additional testing shall be borne by the Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Arcgitect/Engineer for each individual area.

E. Repair of Formed surfaces: Surface defects include color and texture irregularities, crack, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush cut holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Remove and replace concrete defective surfaces if defects cannot be repaired to satisfaction of Architect/Engineer.

F. Repair of Unformed Surfaces: Test unformed surfaces for smoothnes and verify surfaces plan to tolerances specified for each surface and finish. Correct high areas by grinding after

concrete has cured at least 14 days. Correct low areas immediatly after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete.

3.14 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit vehicular traffic over pavement for 7 days minimum after finishing.

END OF SECTION

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SECTION 32 17 13
PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2013.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

D. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

E. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2014.

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking Bumpers: Precast concrete, conforming to the following:
   1. Profile: Manufacturer's standard.
   2. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
   3. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
   4. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
   5. Air Entrainment Admixture: ASTM C260/C260M.
   6. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
   7. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
   8. Embed reinforcing steel, and drill or sleeve for two dowels.
   9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   10. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels per unit.

END OF SECTION

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SECTION 32 17 23.13
PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Parking lot markings, including parking bays and handicapped symbols.

1.03 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

B. Section 32 13 13 - Concrete Paving.

1.04 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

B. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Parking Lots: White.
   2. Handicapped Symbols: White.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.
   1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
   1. Apply paint in one coat only.
   2. Wet Film Thickness: 0.015 inch, minimum.
   3. Width Tolerance: Plus or minus 1/8 inch.

G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

END OF SECTION

SECTION 32 31 36
SECURITY GATES AND BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fixed bollards.

1.02 REFERENCE STANDARDS

A. DOS SD-STD-02.01 - Test Method for Vehicle Crash Testing Of Perimeter Barriers and Gates; U.S. Department of State, Revision A; 2003.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Provide detailed drawings showing:
   1. Foundation and anchoring requirements of the barrier equipment.

PART 2 PRODUCTS

2.01 NON-AUTOMATED BARRIERS

A. Fixed Bollards: Permanently installed tubular steel bollards.
   1. Post Design: Round, diameter 10-3/4 inches.
   2. Mounting: Surface mounted through the flange.
   3. Height: 30 inches.
   4. Finish: Standard powder coat finish - color to be selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions:
   1. Verify location of existing utilities, grades and conditions of substrate.

END OF SECTION

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SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Preparation of subsoil.

B. Hydroseeding, mulching and fertilizer.

C. Maintenance.

1.03 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

B. Section 31 23 23 - Fill: Topsoil material.

1.04 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Certification: Submit certification of grass seed purity.

C. Topsoil samples.

1.06 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Furnish maintenance of seeded areas for three months from Date of Substantial Completion.

D. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:
   1. Common Bermuda (Hulled): 98 percent

2.02 SOIL MATERIALS

A. Topsoil: As specified in Section 31 23 23.

2.03 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:
   1. Nitrogen: 20 percent.
   2. Phosphoric Acid: 20 percent.
   3. Soluble Potash: 10 percent.

C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

D. Erosion Fabric: Jute matting, open weave.

E. Stakes: Softwood lumber, chisel pointed.

F. String: Inorganic fiber.

2.04 TESTS

A. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

B. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 22 00.

B. Place topsoil in accordance with Section 31 22 00.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 HYDROSEEDING

A. Apply seeded slurry with a hydraulic seeder at a rate of 0.6 lbs per 1000 sq ft (25 lbs. per acre) evenly in two intersecting directions.

B. Do not hydroseed area in excess of that which can be mulched on same day.

C. Immediately following seeding, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

D. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.05 PROTECTION

A. Cover seeded slopes where grade is greater than 4 inches per foot with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 12 inch overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.06 MAINTENANCE

A. Provide maintenance at no extra cost to Owner; Owner will pay for water.

B. See Section 01 70 00 - Execution Requirements, for additional requirements relating to maintenance service.

C. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

D. Neatly trim edges and hand clip where necessary.

E. Immediately remove clippings after mowing and trimming.

F. Water to prevent grass and soil from drying out.

G. Roll surface to remove minor depressions or irregularities.

H. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

I. Immediately reseed areas that show bare spots.

J. Protect seeded areas with warning signs during maintenance period.

END OF SECTION

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SECTION 33 05 13
MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Monolithic concrete manholes with transition to lid frame, covers, anchorage, and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints, covers, anchorage, and accessories.

1.03 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

1.04 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2012).

B. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015.

C. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections [Metric]; 2015.

D. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008 (Reapproved 2013).

E. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b (Reapproved 2013).

F. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.

C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

D. Manhole Testing: Results of vacuum testing.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Concrete: As specified in Section 03 30 00.

C. Concrete Reinforcement: As specified in Section 03 30 00.

2.02 COMPONENTS

A. Lid and Frame: ASTM A48/A48M, Class 30B Cast iron construction, machined flat bearing surface, removable lid, closed lid design; traffic weight; lid molded with identifying name.

B. Manhole Steps: Formed galvanized steel rungs; 3/4 inch diameter. Formed integral with manhole sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 MANHOLES

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

E. Set cover frames and covers level without tipping, to correct elevations.

F. Coordinate with other sections of work to provide correct size, shape, and location.

3.04 TESTING

A. Test sanitary sewer manholes in accordance with ASTM C1244.

B. If the vacuum reading drops more than one (1) inch before the appropriate time has elapsed, the manhole shall have failed the test. The Contractor shall be required to uncover, replace, or repair any or all sections of the manhole and retest.

END OF SECTION

SECTION 33 11 16

SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Pipe and fittings for site water lines including domestic water lines and fire water lines.

B. Valves and Fire hydrants.

1.03 DESCRIPTION OF WORK

A. Exterior water distribution system work is shown on the drawings and includes all pipe, valves, meters if required, hydrants and other items required to provide service from 5 feet outside of building to tie in with local utility lines unless shown otherwise.

B. Contractor shall pay all cost required by the utility company pertaining to construction and tie-in. Deposits required for permanent service will be paid by the Owner.

1.04 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for thrust restraints.

B. Section 09 91 13 - Exterior Painting.

C. Section 31 23 16 - Excavation: Excavating of trenches.

D. Section 31 23 23 - Fill: Bedding and backfilling.

E. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of site service utility water piping.

1.05 REFERENCES

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

C. ASTM B43 - Standard Specification for Seamless Red Brass Pipe, Standard Sizes; 2014.

D. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

E. ASTM B687 - Standard Specification for Brass, Copper, & Chromium-Plated Pipe Nipples; 1999.

F. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.

G. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

H. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

I. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; 2013.

J. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

K. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

L. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.

M. AWWA C502 - Dry-Barrel Fire Hydrants; 2014.

N. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2009.

O. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; 2010.

P. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2007.

Q. UL 246 - Hydrants for Fire-Protection Service; Current Edition, Including All Revisions.

1.06 DEFINITIONS

A. Bedding: Fill placed under, beside and to 6 inches over pipe, prior to subsequent backfill operations.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

D. Testing: Results of hydrostatic tests.ASTM B418

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

B. Comply with applicable requirements of locally adopted plumbing codes.

C. Local codes and utility company requirements take precedence over the Construction Documents.

D. Fire protection work shall also comply with NFPA requirements.

E. Verify with local water utility company the meter size required to allow sufficient discharge flow pressure for proper sanitary operation of all fixtures in the Project, and fire protection if required.

F. The contractor shall furnish the meter if the utility company does not.

G. Obtain all necessary permits and approvals.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 WATER PIPE

A. Ductile Iron Pipe (For pipe 3 inch diameter & greater): AWWA C151:
   1. Fittings: Ductile or gray iron, AWWA C110, with mechanical joints.
   2. Joints: AWWA C111, rubber gasket.
   3. Cement Lining: AWWA C104 with sealcoat.
   4. Encasement: AWWA C105 polyethylene encasement.

B. Copper Tubing (For pipe less than 4 inch diameter): ASTM B88, Type K, annealed:
   1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
   2. Joints: Compression connection or AWS A5.8, BCuP silver braze.

C. PVC Pipe (For pipe less than 4 inch diameter): ASTM D 2241 SDR 17 for 250 psig rating.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: ASTM D 3139 compression gasket ring.

D. PVC Pipe (For pipe 4 inch to 12 inch diameter): AWWA C900 Class 150:
   1. Fittings: Ductile or gray iron, AWWA C110, with mechanical joints.
   2. Joints: ASTM D3139 compression gasket ring.

E. Marking Tape (for plastic pipe): Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service " in large letters

F. Trace Wire (for plastic pipe): 14 Ga. bare copper trace wire.

2.02 PIPE NIPPLES FOR SCREWED CONNECTIONS

A. Pipe Nipples for Screwed Connections Up to 3 Inches (75mm);
   1. Red Brass, Sch 80.ASTM B43

2.03 VALVES

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Gate Valves Up To 3 Inches:
   1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression or threaded connections, with valve box.

C. Gate Valves 3 Inches and Over:
   1. AWWA C509, iron body, bronze trim, non-rising stem with square nut, single wedge, resilient seat, mechanical joint ends, with valve box.

2.04 HYDRANTS

A. Hydrants: Type as required by utility company.

B. Hydrants: AWWA C502, UL 246, dry barrel type.
   1. Inside dimension: 7 inches minimum, with minimum 5 inches diameter valve seat opening.

C. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

D. Finish: Primer and two coats of enamel in color required by utility company.

2.05 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: Sand or granular fill as specified in Section 31 23 23 - Fill.

B. Pipe Cover Material: Structural fill under pavements, slabs-on-grade, and similar construction as specified in Section 31 23 23 - Fill.

C. Pipe Cover Material: General fill under lawns as specified in Section 31 23 23 - Fill.

2.06 ACCESSORIES

A. Concrete for Thrust Restraints: 2000 psi at 28 days.

B. Trace Wire for Non-metallic Pipe: 14 Gage bare copper wire.

PART 3 EXECUTION

3.01 SANITARY AND SAFETY HAZARDS

A. The operating routine shall include necessary protective measures to detect and remove or destroy any contaminant of concern or regulation that might enter the distribution system. Every precaution must be taken against the possibility of sewage contamination of the water in the distribution system. Water mains and sanitary sewers shall be constructed as far apart as practicable, and shall be separated by undisturbed and compacted earth. A minimum horizontal distance of ten feet shall be maintained between water lines and sewer lines or other sources of contamination. Water lines and sewers shall not be laid in the same trench, except on the written approval of the Arkansas Department of Health. Water mains necessarily in close proximity to sewers shall be placed so that the bottom of the water line is at least 18 inches above the top of the sewer line at its highest point. If this distance must unavoidably be reduced, the water line or the sewer line shall be encased in watertight pipe with sealed watertight ends extending at least ten feet either side of the crossing. Any joint in the encasement pipe shall be mechanically restrained. The encasement pipe may be vented to the surface if carrying water or sewer under pressure. Where a water line must unavoidably pass beneath the sewer line, at least 18 inches of separation shall be maintained between the outside of the two pipes in addition to the preceding encasement requirement. Exceptions to this shall be approved in writing by the Arkansas Department of Health.

B. A minimum horizontal distance of three feet shall be maintained between water lines and other underground utilities of a non-sanitary nature (gas, electric, etc.). Exceptions to this shall be approved in writing by the Arkansas Department of Health.

3.02 EXAMINATION

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

3.03 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.04 TRENCHING

A. Bottom Of Trenches: Remove and replace all unstable soil or rubble fill encountered at bottom of trench with thoroughly consolidated bedding material. Keep trench clear of water at all times. Allow 6 inches over-excavation for bedding under pipe.

B. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil in accordance with NFPA 24.

C. Backfill around sides and to 6 inches over top of pipe with bedding for plastic pipes or cover fill for metallic pipe in 6" maximum lifts, tamp fill under pipe haunches and compact, then complete backfilling.

3.05 INSTALLATION - PIPE

A. Separation Of Water And Sewer Lines:
   1. Water and sewer lines shall have a 10'0" horizontal separation.
   2. Where water and sewer lines cross, an 18 inch vertical separation shall be made between the top of the lower pipe and the bottom of the upper pipe.
   3. The water line shall be above the sewer line if possible.

B. Establish elevations of buried piping to ensure not less than 3 ft of cover.

C. Install pipe to indicated elevation to within tolerance of 2 inches.

D. Install ductile iron piping and fittings in polyethylene encasement, per local utility company requirements, if any.

E. Install ductile iron piping and fittings to AWWA C600.

F. Route pipe in straight line.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install access fittings to permit disinfection of water system performed under Section 33 13 00.

I. Install trace wire for non-metallic pipe 6 inches above top of pipe. Pull trace wire up in valve and meter boxes.

J. Install marking tape for non-metallic pipe 12" below finished grade in lawn areas and under walks; 6" below bottom of pavements.

3.06 INSTALLATION - VALVES AND HYDRANTS

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

F. Paint hydrants in accordance with Section 09 91 13.

3.07 SERVICE CONNECTIONS

A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with bypass valves and sand strainer.

3.08 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

3.09 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Perform hydrostatic pressure and leakage test of the system to 200 psi. for not less than two (2) hours in accordance with AWWA C600. Repair leaks and re-test piping sections that fail the test.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF SECTION

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SECTION 33 13 00

DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 11 16.

B. Disinfection of building domestic water piping specified in Section 22 10 05.

C. Testing and reporting results.

1.03 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping: Disinfection of building domestic water piping system.

B. Section 33 11 16 - Site Water Utility Distribution Piping.

1.04 REFERENCE STANDARDS

A. AWWA B300 - Hypochlorites; 2011.

B. AWWA B301 - Liquid Chlorine; 2010.

C. AWWA B302 - Ammonium Sulfate; 2010.

D. AWWA B303 - Sodium Chlorite; 2010.

E. AWWA C651 - Disinfecting Water Mains; 2005.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate results comparative to specified requirements.

C. Certificate: From authority having jurisdiction indicating approval of water system.

D. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.

E. Disinfection report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
   5. Date and time of flushing start and completion.
   6. Disinfectant residual after flushing in ppm for each outlet tested.

F. Bacteriological reports:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Certification that water conforms, or fails to conform, to bacterial standards of state health authority.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

B. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of the State of Arkansas.

C. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping system has been cleaned, inspected, and pressure tested.

B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

3.03 ACCEPTANCE OF WATER LINES TO PLACE IN SERVICE:

A. Two consecutive days of coliform absent bacterial tests are required.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Test samples in accordance with state health authority requirements.

END OF SECTION

SECTION 33 31 11

SITE SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout access.

1.03 DESCRIPTION OF WORK

A. Exterior sanitary sewer system work is shown on the drawings and includes all pipe, manholes, fittings and other items required to provide service from 5 feet outside of building to tie in with local utility lines, unless shown otherwise.

1.04 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 23 - Fill: Bedding and backfilling.

C. Section 33 05 13 - Manholes and Structures.

1.05 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.06 REFERENCE STANDARDS

A. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.

B. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2009 (Reapproved 2014).

C. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.

D. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2009.

E. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2005).

F. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

G. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

H. ASTM F1417 - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air; 2011a.

I. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.08 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories.

C. Tests: Pressure test results of sewer lines.

D. Project Record Documents:
   1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Provide products that comply with applicable code(s).

B. Cast Iron Soil Pipe: ASTM A74, service type, inside nominal diameter of 4 inches, hub and spigot end.

C. Joint Seals for Cast Iron Pipe: ASTM C564 rubber gaskets.

D. Ductile Iron Pipe: ASTM A 746, Pressure Class 350, with ceramic epoxy lining, bell and spigot end.

E. Joint Seals for Ductile Iron Pipe: AWWA C111/A21.11 rubber gaskets.

F. Lining for Ductile Iron Pipe: Ceramic epoxy coating equal to PROTECTO 401, by Induron.

G. Plastic Pipe: ASTM D 3034, Type PSM, SDR26, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 4 to 6 inches, bell and spigot style gasketed joints.

H. Plastic Pipe: ASTM D 3034, Type PSM, SDR35, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 8 inches to 15 inches, bell and spigot style gasketed joints.

I. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

J. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, and other configurations required.

B. Cleanouts: Cleanout ferrule with plug shall be brass equal to Wade #8550.

C. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.

2.03 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: Granular fill as specified in Section 31 23 23 - Fill.

B. Pipe Cover Material: Structural fill under pavements,slabs-on-grade, and similar construction as specified in Section 31 23 23 - Fill.

C. Pipe Cover Material: General fill under lawns as specified in Section 31 23 23 - Fill.

PART 3 EXECUTION

3.01 GENERAL

A. Perform work in accordance with applicable code(s).

3.02 TRENCHING

A. Bottom Of Trenches: Remove and replace all unstable soil or rubble fill encountered at bottom of trench with thoroughly consolidated bedding material. Keep trench clear of water at all times. Allow 6 inches over-excavation for bedding under pipe.

B. Backfill around sides and to 6 inches over top of pipe with bedding for plastic pipes or cover fill for metallic pipe in 6" maximum lifts, tamp fill under pipe haunches and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building sanitary sewer outlet and municipal sewer system .

E. Install trace wire 6 inches above top of pipe; coordinate with Section 31 23 16.13.

3.04 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for cast iron riser.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount cleanout fellule in bell end of cast iron soil pipe riser level at finished grade. Install 4" cleanouts on 4" piping and 6" cleanouts on 6" and larger piping.

E. Secure cleanout top with a 2' diameter x 6" thick concrete pad at grade in lawn areas

3.05 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

C. Pressure Test: Test in accordance with ASTM F1417.

D. Deflection Test: After the sewer line has been laid and backfilled, the Contractor shall pull a mandrell through the line without a mechanical pulling device. The maximum deflection allowable shall not exceed 5 percent of the internal pipe diameter.

3.06 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

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SECTION 33 51 11

SITE NATURAL-GAS DISTRIBUTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. Pipe and fittings for natural gas distribution on site outside buildings.

1.03 DESCRIPTION OF WORK

A. Gas distribution system shall include all pipe and appurtenances 5 feet outside of building or as indicated on the Plans. The system shall include complete tie in with utility lines, unless shown otherwise.

B. Contractor shall pay all cost required by utility company pertaining to construction and tie in. Deposits required for permanent service will be paid by the Owner.

1.04 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation: Excavating of trenches.

B. Section 31 23 23 - Fill: Bedding and backfilling.

1.05 REFERENCE STANDARDS

A. AGA XR0104-AGA Plastic Pipe Manual for Gas Service; 2001.

B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

C. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2011.

D. ASME B16.40 - Manually Operated Thermoplastic Gas Shutoffs and Valves in Gas Distribution Systems; 2002.

E. ASME B31.8 - Gas Transmission and Distribution Piping Systems; 2014.

F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

H. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2014.

I. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing; 2014.

1.06 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Project Record Documents: Record actual locations of pipe mains, valves, connections, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.07 DEFINITIONS

A. Bedding: Fill placed under, beside and to 6 inches over pipe, prior to subsequent backfill operations.

1.08 QUALITY ASSURANCE

A. Perform Work in accordance with utility company requirements.

B. Conform to ASME B31.8.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.01 PIPE

A. Steel Pipe Above Ground: ASTM A53/A53M, Schedule 40 black:
   1. Fittings: ASME B16.3 malleable iron, ASME B16.11 forged steel, or ASTM A234/A234M wrought steel welding type.
   2. Joints: Threaded.

B. Polyethylene Pipe Below Ground: ASTM D2513, SDR11:
   1. Fittings: ASTM D2513.
   2. Joints: Fusion Welded.

C. Transition Fittings for Joining Steel and Polyethylene Pipe: AGA XR0104.

D. Marking Tape (for plastic pipe): Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service " in large letters

E. Trace Wire (for plastic pipe): 14 Ga. bare copper wire.

2.02 GAS COCKS AND VALVES

A. Gas Cock and Pressure Regulating Valves: Manufacturer's name and pressure rating marked on valve body.

B. Gas Cocks Up to 2 Inches for Aboveground Use: 150 psig WOG, bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends with cast iron curb box, cover, and key.

C. Gas Cocks Over 2 Inches for Aboveground Use: 125 psig WOG, Steel body and tapered plug, non-lubricated, Teflon packing, threaded ends, with cast iron curb box, cover, and key.

D. Gas Valves for Underground Use: Polyethylene conforming to ASME B16.40, with cast iron valve box and cover.

E. Pressure Regulating Valves: Single stage, malleable iron body, corrosion-resistant, pressure regulator with atmospheric vent, elevation compensator; with threaded ends for 2 inch and smaller, flanged ends larger than 2 inch.
   1. Capacity: For inlet and outlet gas pressures, specific gravity, and flow rate indicated.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: Sand as specified in Section 31 23 23 - Fill.

B. Pipe Cover Material: Structural fill under pavements,slabs-on-grade, and similar construction as specified in Section 31 23 23 - Fill.

C. Pipe Cover Material: General fill under lawns as specified in Section 31 23 23 - Fill.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building service connection and utility gas main size, location and invert are as indicated.

3.02 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Bevel plain end ferrous pipe over 2 inches diameter. Thread ferrous pipe 2 inches diameter and under.

B. Remove scale and dirt on inside and outside before assembly.

3.03 TRENCHING

A. Bottom Of Trenches: Remove and replace all unstable soil or rubble fill encountered at bottom of trench with thoroughly consolidated bedding material. Keep trench clear of water at all times. Allow 6 inches over-excavation for bedding under plastic pipe.

B. Backfill around sides and to 6 inches over top of pipe with bedding in 6" maximum lifts, tamp fill under pipe haunches and compact, then complete backfilling.

3.04 INSTALLATION - PIPING

A. Group piping with other site piping work whenever practical.

B. Route piping in straight line.

C. Install piping to conserve space and not interfere with use of site space.

D. Install piping to allow for expansion and contraction without stressing pipe or joints.

E. Install cocks and other fittings.

F. Establish elevations of buried piping to ensure not less than 24 inches of cover in non-travelled areas and 30 inches of cover in driveways and parking areas.

G. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve.

H. Install trace wire 6 inches above top of pipe. Pull trace wire up in valve boxes and at risers.

I. Install marking tape 12" below finished grade in lawn areas and under walks; 6" below bottom of pavements.

3.05 SERVICE CONNECTIONS

A. Provide sleeve in foundation wall for gas service main. Seal enlarged sleeve watertight.

B. Install service regulator adjacent to building wall in specified location.

C. For plastic service pipe, use steel transition fitting to connect below grade poyethylene to above grade steel pipe.

D. Install riser pipe to prevent undue stress upon service pipe.

E. Provide regulator vent with rain and insect proof opening, terminating away from building openings.

3.06 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00 - Quality Requirements.

B. Pressure test gas piping to 60 psi for a period of two hours.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

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Project Manual for

NEW JUNIOR AND SENIOR HIGH SCHOOL

Buffalo Island Central School District, Monette, Arkansas

CROMWELL

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