Specifications

COURTHOUSE ANNEX BUILDING
POINSETT COUNTY
Harrisburg, Arkansas

Commission No. 2237

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SECTION 00 0101

PROJECT TITLE

COURTHOUSE ANNEX BUILDING
POINSETT COUNTY
HARRISBURG, ARKANSAS

OWNER:
POINSETT COUNTY, ARKANSAS
401 MARKET ST.
HARRISBURG, AR 72432

OWNER'S REPRESENTATIVE:
J.C. CARTER, COUNTY JUDGE
(870) 578-0601

ARCHITECT:
BRACKETT KRENNERICH ARCHITECTS
100 E. HUNTINGTON, SUITE D
POST OFFICE BOX 1655
JONESBORO, ARKANSAS 72403-1655
(870) 932-0571

CONSULTING ENGINEERS:

CIVIL ENGINEER
ASSOCIATED ENGINEERS AND TESTING, LLC
103 S. CHURCH STREET
JONESBORO, AR 72401
(870) 932-3594

STRUCTURAL ENGINEER
SMITH ENGINEERING
PO BOX 299
MARION, AR 72364
(870) 739-5533

MECHANICAL/PLUMBING/ELECTRICAL ENGINEER
STRICKLAND ENGINEERING
113 W. MAIN ST., SUITE 1
JACKSON, MO 63755

COMMISSION NUMBER: 2237

PROJECT DOCUMENTS DATE: JULY 26, 2024

DIVISION 00

PROCUREMENT
AND CONTRACTING REQUIREMENTS

00 0110

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07/26/2024

SECTION 00 0115
LIST OF DRAWING SHEETS

THE FOLLOWING DRAWINGS DATED JULY 26, 2024 BEARING THE ARCHITECT'S COMMISSION NUMBER 2237 WITH THESE SPECIFICATIONS FORM THE CONTRACT DOCUMENTS.

REFERENCE
REF1..... TOPOGRAPHIC SURVEY (REFERENCE ONLY)

CIVIL
C001 ..... SITE PLAN & DETAILS
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A003 ..... FLOOR FINISHES PLAN, FINISH SCHEDULE
A100 ..... FIRST FLOOR PLAN, WALL TYPES
A101 ..... SECOND FLOOR PLAN
A102 ..... ROOF PLAN & DETAILS
A200 ..... EXTERIOR BUILDING ELEVATIONS
A201 ..... EXTERIOR BUILDING ELEVATIONS
A202 ..... BUILDING SECTIONS
A300 ..... ENLARGED STAIR PLANS, STAIR DETAILS
A400 ..... FIRST FLOOR REFLECTED CEILING PLAN
A500 ..... WALL SECTIONS
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A502 ..... WALL SECTIONS
A600 ..... STANDARD MOUNTING HEIGHTS, ADA NOTES
A601 ..... ENLARGED TOILET PLANS, TOILET ELEVATIONS
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S101 ..... FOUNDATION DETAILS
S200 ..... FLOOR FRAMING PLAN & DETAILS
S201 ..... ROOF FRAMING PLAN & DETAILS
S202 ..... FRAMING DETAILS

MECHANICAL
M100..... MECHANICAL TITLE SHEET
M101..... FIRST FLOOR HVAC PLAN
M101A ..... FIRST FLOOR MECHANICAL PIPING PLAN
M102..... SECOND FLOOR HVAC PLAN
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M104..... VRF SCHEDULES AND DETAILS
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PLUMBING

P100 ..... PLUMBING TITLE SHEET
P101 ..... FIRST FLOOR WASTE & VENT PIPING PLAN
P102 ..... SECOND FLOOR WASTE & VENT PIPING PLAN
P103 ..... PLUMBING DETAILS
P201 ..... FIRST FLOOR SUPPLY PIPING PLAN

FIRE PROTECTION

FP100 ..... FIRE PROTECTION TITLE SHEET
FP101 ..... FIRST FLOOR FIRE PROTECTION
FP102 ..... SECOND FLOOR FIRE PROTECTION

ELECTRICAL

E100 ..... ELECTRICAL TITLE SHEET
E101 ..... FIRST FLOOR POWER PLAN
E102 ..... SECOND FLOOR POWER PLAN
E103 ..... ELECTRICAL SCHEDULES & DETAILS
E201 ..... FIRST FLOOR LIGHTING PLAN
E202 ..... SECOND FLOOR LIGHTING PLAN
FA101 ..... FIRST FLOOR FIRE ALARM PLAN
FA102 ..... SECOND FLOOR FIRE ALARM PLAN
SE101 ..... FIRST FLOOR SECURITY PLAN
SE102 ..... SECOND FLOOR SECURITY PLAN
T101..... FIRST FLOOR TELECOM PLAN

End of List of Drawings

SECTION 00 1113

ADVERTISEMENT FOR BIDS

Qualified Contractors are invited to bid on a contract for **"Courthouse Annex Building, Poinsett County, Harrisburg, Arkansas"**. The bids shall be on a lump sum basis.

Craighead County, hereinafter termed owner, will receive bids until **2:00 p.m., Tuesday, August 20, 2024.** Bids may be mailed or delivered in care of J.C. Carter, County Judge, 401 Market St., Harrisburg, AR 72432. Bids received after this time will not be accepted.

Bids will be publicly opened and read aloud at the stated time in the Conference Room of the Poinsett County Annex, 110 East St., Harrisburg, Arkansas, 72432.

Project scope consists of an approximately 6,350 SF (plus 6,350 SF of unfinished attic), two story building, to house government services for Poinsett County.

Plans, specifications, bid forms, and other contract documents may be examined at the office of the architect. The official version of the complete set of the contract documents should be examined and are obtainable from:

Jonesboro Blueprint
222 Madison Street
Jonesboro, AR 72401
(870) 932-4349

Southern Reprographics
901 W. 7th Street
Little Rock, AR 72201
(501) 372-4011

Obtaining contract documents through any source other than the Design Professional or their representative(s) is not advisable due to the risks of receiving incomplete or inaccurate information. Contract documents obtained through the Design Professional or their representative(s) are considered the official version and take precedence should any discrepancies occur. General contractors may obtain two (2) complete sets of bidding documents upon deposit of **$250.00 per set, payable to Brackett-Krennerich & Associates, P.A.** which is refundable, less postage/shipping costs, if applicable, to bona fide bidders upon return of documents in good condition within 10 days after bid date.

Additional sets of documents may be obtained for use by subcontractors and material suppliers upon receipt of **$125.00** per set which is refundable less cost of reproduction **(50% refundable)**, and less postage/shipping costs if applicable, upon return of documents in good condition within 10 days after the bid date. No partial sets will be issued.

Bid Security in the amount of five percent (5%) of the bid must accompany each bid in accordance with the Instructions to Bidders.

Bidders shall conform to the requirements of the Arkansas licensing laws and regulations for contractors, and shall be licensed before his bid is submitted.

Bidders are hereby notified that the provisions of the Davis-Bacon Act & Federal Prevailing Wage Rates apply to portions of this project.

Poinsett County encourages all small, minority, and women business enterprises 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.

There will be a **Pre-Bid Conference** held at the site at 110 East St., Harrisburg, AR 72432 on **Tuesday, August 13, 2024.** The conference will start at exactly **2:00 p.m.** Prime contractors who arrive late or fail to attend this meeting may forfeit their bidding privilege. The owner reserves the right to waive this requirement and/or schedule additional meetings.

The owner reserves the right to reject any and all bids, or to waive any formalities.

J.C. Carter, County Judge
Poinsett County, Arkansas

SECTION 00 2100
INSTRUCTIONS TO BIDDERS

1.01 RECEIPT AND OPENING OF BIDS

A. Owner: Poinsett County, Arkansas

B. Bid Location: **Poinsett County Judge's Office, 401 Market St., Harrisburg, AR 72432**

C. Bid Date/Time: **August 20, 2024**

D. The owner reserves the right to reject any or all bids and to waive formalities.

E. The owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities.

F. Owner assumes no obligations to accept the lowest bid or any bid withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof.

G. Any bid received after the time and date specified shall not be considered.

H. No bidder may withdraw a bid within 30 days after the actual date of the opening thereof.

1.02 PREPARATION OF BID

A. Each bid must be submitted on the prescribed forms.

B. All blank spaces for bid prices must be filled, in ink or typewritten.

C. Bids must be signed in ink showing title or authority to bind bidder to a contract.

D. Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, the name of the project and the contractor's license number as issued and approved by Arkansas State Licensing Board previous to bid date. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope as specified in the bid form.

1.03 PROPRIETARY INFORMATION

A. 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 Owner does not warrant or agree to, but will endeavor to keep that information confidential. Contractor acknowledges that information in the possession of the City of Jonesboro may be subject to the provisions of the Arkansas Freedom of Information Act.

1.04 SEVERABILITY

A. The finding or determination of any part or parts of the general instructions, 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.

1.05 BIDDING DOCUMENTS

A. Bidders may obtain complete sets of Contract Documents from the architect.

B. Complete sets of Contract Documents must be used in preparing bids; neither Owner nor Design Professional assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents.

C. Obtaining Contract Documents through any source other than the architect is not advisable due to the risks of receiving incomplete or inaccurate information, and the bidder runs the risk of basing bidder's proposal on such information.

D. The documents obtained through the architect are considered the official version and take precedence if any discrepancies occur.

E. The fact that documents used for bidding purposes are named "Contract Documents" does not diminish in any way the right of the owner to reject any and all bids and to waive any formality.

1.06 QUALIFICATION OF BIDDER

A. The owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the owner all such information and date of same for this purpose as the owner may request.

B. The owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein.

C. Conditional bids will not be accepted.

D. All bidders shall comply with the requirements of the Contractor's Licensing Law of the State of Arkansas, Arkansas Code Annotated § 17-25-101 et seq.

1. **Note: All contractors must be licensed the day the project bids.**

E. The company may be required, upon request, to prove to the satisfaction of the owner 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.

1.07 ASSIGNMENTS

A. 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 Owner.

B. No contractor, subcontractor 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 written approval of the Owner.

1.08 CONFLICT OF INTEREST

A. By submitting a bid, the contractor represents and warrants that no employee of the Owner 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 Owner.

B. 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.

1.09 NON-COLLUSIVE AFFIDAVIT

A. 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 or made for or on behalf of any person not named, and that he has neither induced or 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.

1.10 BID SECURITY

A. Each bid proposal shall include with it a bid security in the amount of 5% of the total bid offered.

B. The bidder will be required to submit a bidder's deposit which includes enclosing a cashier's check payable to the order of the owner drawn upon and certified by a bank or trust company doing business in Arkansas or by a corporate bid bond in an amount equal to 5% of the bid.

C. Such bid bonds will be returned to all except the three lowest bidders within three days after the opening of the bids, and the remaining bid bonds will be returned promptly after the owner and the accepted bidder have executed the contract, or if no bids were accepted, upon demand of the bidder at the time specified, so long as he has not been notified of the acceptance of his bid.

1.11 LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

A. The successful bidder, upon his/her failure to execute the contract and bonds required within ten (10) days after he has received notice of the acceptance of his bid, shall forfeit to the owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

1.12 TIME OF COMPLETION / LIQUIDATED DAMAGES

A. Bidder must agree to commence work within ten (10) days of the date of the "Notice to Proceed" of the owner and to fully complete the project. Complete the work by October 15, 2025.

B. The contractor will proceed with the work at such rate of progress to insure full completion within the contract time. It is expressly understood and agreed, by and between the contractor and the owner, that the contract time for completion of the work described in the contract is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

C. If the contractor shall fail to complete the work within the contract time, of extension of time granted by the owner, then the contractor will pay to the owner the amount of **Two Hundred Dollars ($200.00)** for liquidated damages for each calendar day that the contractor shall be in default after the time stipulated in the contract documents for each phase of the work.

D. Time extensions will be granted to the contractor only when the delay in completion of the work is due to the following and the contractor has promptly given written notice of such delay to the owner or architect.
   1. To any preference, priority or allocation order duly issued by the owner.
   2. To unforeseeable causes beyond the control and without the fault or negligence of the contractor, including, but not restricted to, acts of God, or the public enemy, acts of the owner, acts of another contractor in the performance of a contract with the owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and
   3. To any delays of subcontractors occasioned by any of the causes specified in 1. and 2. above.

1.13 CONDITIONS OF WORK/EXAMINATION OF SITE OF WORK

A. Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor therein.

B. Bidder shall examine the Contract Documents and visit the project site of work.

C. Bidder shall become familiar with all existing conditions and limitations under which the work is to be performed, and shall base bid on items necessary to perform the work as set forth in the contract documents.

D. No allowance will be made to Bidder because of lack of such examination or knowledge.

E. The submission of a bid shall be construed as conclusive evidence that the Bidder has made such examination.

1.14 PRE-BID CONFERENCE

A. A Pre-Bid Conference is to be held **at the project site. Meet at the Courthouse Annex Building, 110 East St., Harrisburg, AR on Tuesday, August 13, 2024 at 2:00 p.m.**

B. The meeting will begin precisely at **2:00 p.m.**

C. Prime contractors who arrive late or fail to attend this meeting may forfeit their bidding privilege.

D. The owner reserves the right to waive this requirement and/or schedule additional meetings.

1.15 ADDENDA AND INTERPRETATIONS

A. No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally.

B. Every request for such interpretation should be in writing addressed to: Brackett Krennerich and Associates, P.A., Architects, 100 E. Huntington, Suite D, Post Office Box 1655, Jonesboro, Arkansas 72401/72403 and to be given consideration must be received at least three (3) days prior to the date fixed for the opening of bids.

C. All such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed and faxed to all prospective bidders (at the respective addresses and fax numbers furnished for such purposes), not later than three days prior to the date fixed for the opening of bids.

D. All addenda so issued shall become part of the contract documents.

1.16 SECURITY FOR FAITHFUL PERFORMANCE

A. Simultaneously with his delivery of the executed contract, the contractor shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under the contract and furnishing materials in connection with this contract, as specified in the General Conditions included herein.

B. The surety on such bond or bonds shall be a surety company duly authorized to do business in the State of Arkansas and satisfactory to the owner.

1.17 POWER OF ATTORNEY

A. Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

1.18 TAXES, LAWS, AND REGULATIONS

A. The bidders' attention is directed to the fact that all applicable sales tax, social security taxes, state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout; and they will be deemed to be included in the contract, inspection fees, licenses, and building permits where required.

B. The contractor shall pay for all such taxes and fees required for this project.

C. Labor. Contractors employed upon the work will be required to conform to the labor laws of the State of Arkansas and various acts amendatory and supplementary thereto, and to all laws, regulations, and legal requirements applicable thereto.

D. State licensing laws for contractors.

1.19 DISCRIMINATION

A. Bidder shall not discriminate against any employee, applicant for employment, or subcontractor as provided by law.

B. Bidder shall be responsible for ensuring that all subcontractors comply with federal and state laws and regulations related to discrimination.

C. Upon final determination by a court or administrative body having proper jurisdiction that the Bidder has violated state or federal laws or regulations, the Owner may impose a range for appropriate remedies up to and including termination of the contract

1.20 SUBMISSION OF POST-BID INFORMATION

A. The selected bidder shall within seven (7) days after "Notice of Intent of Award of Contract" submit the following:
   1. A statement of costs of each major item of work included in his bid.
   2. A designation of the work to be performed by the bidder with his own forces.
   3. A list of names of subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design), proposed for the principal portions of the work, including suppliers of major equipment. Prior to the award of the contract, the architect will notify the bidder in writing if either the owner or the architect, after due investigation, has reasonable and substantial objection to any person or organization on such list. If the owner refuses in writing to accept such person or

organization, the bidder may, at his option withdraw his bid without forfeiture of bid security, notwithstanding anything to the contrary contained in Paragraph 1.11 "Liquidated Damages for Failure to Enter into Contract." Subcontractors and other persons and organizations proposed by the bidder and accepted by the owner and the architect must be used on the work for which they were proposed and accepted and shall not be changed except with the written approval of the owner and the architect.

a. Note: Subcontractors referred to in above paragraph are those subcontractors other than those listed on bid form. Subcontractors listed on the bid form must be used for work listed in compliance with Arkansas Statutes, Arkansas Code Annotated § 22-9-204.

B. Upon completion of the project, List of Subcontractors, AIA Document G-805, shall be completed to include subcontractors and suppliers of major equipment, complete with names and addresses, along with telephone numbers.

1.21 SUBCONTRACTORS

A. Arkansas Code Annotated § 22-9-204, requires that in each instance where the total bid submitted by the licensed prime contractor exceeds $50,000.00, all prime contractors, as a condition to perform work for and in the State of Arkansas shall use no other subcontractors when the subcontractors' portion of the project is $50,000 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC-R), Plumbing, Electrical and Roofing.

B. For those bids where the listed work is $50,000 or more, the prime contractor must make a definite decision as to which subcontractor he intends to use. The prime contractor shall place the names, licenses of each subcontractor and indicate on the space provided on the Form of Proposal the amount of the listed work is $50,000 or more. The prime contractor may use his own forces to do the listed work, however if the listed work is $50,000 or more, the prime contractor must be qualified and licensed by the Arkansas Contractors Licensing Board to perform the listed work. Once the prime contractor determines his own forces will be used, he shall place his name, license number and indicate on the space provided on the Form of Proposal the amount of listed work is $50,000 or more.

C. In the event, the amount of the listed work is below $50,000, the Prime Contractor shall place the names of the person or firm performing the work and indicate on the space provided on the Form of Proposal the listed work is under $50,000.

D. Failure to fill the form correctly shall cause the bid to be declared non-responsive and the bid will not receive consideration.

E. In the event that one (1) or more of the subcontractors named by the prime contractor in his successful bid thereafter refuse to perform his contract or offered contract, the prime contractor may substitute another subcontractor, after having obtained prior approval from the architect or engineer, and the owner.

F. The prime contractor shall submit written evidence that the substituted contractor is costing the same amount of money or less and, if costing less, that his savings will be deducted from the total contract of the prime contractor and rebated to the owner.

G. It shall be mandatory that any subcontractors listed in (A) – (D) on the form of proposal by the Prime Contractor be awarded a contract under Arkansas Code Annotated § 22-9-204.

H. Subcontractors List:
   1. Mechanical H.V.A.C.
   2. Plumbing
   3. Electrical (cannot be included in the Mechanical Bid)
   4. Roofing and Sheet metal

I. Electrical License Requirement
   1. No person shall perform electrical work on the contract without processing 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.

2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

1.22 STANDARDS OF QUALITY

A. Reference in the specifications to any article, device, product, material, fixture, etc., by name, manufacturer, or catalog numbers, shall be interpreted as establishing a standard of quality and shall not be considered or construed as limiting competition.

B. The contractor may use any article, device, product, material, fixture, etc., which, in the judgment of the architect, and with written approval, is equal to that specified.

1.23 SUBSTITUTION APPROVAL

A. Request for approval and/or substitutions prior to the time/date for receiving bids on this project shall be submitted to the architect, in written form, only through general contractors or prime contractors who propose to submit bids.

B. Submission of each request shall be in accordance with Section 01 6300 – Product Options and Substitutions.

C. Such requests shall include a complete description of the proposed substitution with drawings, cuts, performance and test data, or information necessary for a complete evaluation.

1.24 METHOD OF BIDDING

A. Base Bid:

1. Base bid to be a lump sum bid including all construction work required to complete the total project in accordance with the requirements of the contract documents and shall cover all new construction including Site Work, Mechanical H.V.A.C. Work, Plumbing Work, Electrical Work, Roofing and Sheet metal Work.

1.25 EVALUATION AND CONSIDERATION OF BIDS

A. It is the intent of the Owner to award a contract to the lowest responsive, qualified Bidder provided the bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available.

B. The Owner shall have the right to waive formalities in a bid received and to accept the bid which, in the Owner's judgment, is in the Owner's own best interests.

C. The Owner shall have the right to accept any bid for a period not to exceed 30 days.

D. Bids will be considered on the basis of price, however, the Owner 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 Owner, is the best qualified to perform the work.

1.26 TIE BIDS

A. If two or more sealed bids are equal in amount, meet specifications, and are the lowest received at the bid opening, then the apparent low bidder will be determined by lot (placing the name of the tie bidders into a container and drawing one name).

B. The drawing will be done by the owner or another person so designated by the owner in the presence of a witness and tie bidders. The witness shall be an employee of the Owner.

C. Documentation of the drawing must be included on the bid tabulation and signed by those present.

D. Nothing in the above and foregoing will diminish the owner's reserved right to reject any and all bids and to waive formalities.

1.27 MODIFICATION, WITHDRAWAL AND SCRIVENER'S ERROR

A. Modification and Withdrawal. Bidder may withdraw bid at any time before bid opening and may resubmit up to the date and time designated for receipt of bids. No bid may be withdrawn or modified after time has been called for the bid opening. Oral modifications to bids will not be

considered. Bidder may submit written modifications to bid in writing, or by facsimile at any time prior to the expiration of the bidding time and date and shall so word the modification(s) as to not reveal the amount of the original bid. Facsimile modifications shall require written confirmation over the Bidder's signature within 24 hours after bid opening.

B. Scrivener's Error. Pursuant to Ark. Code Ann. § 19-4-1405 (e), bidders may request in writing, to be relieved of their bid any time after the bid opening, but no later than 72 hours after receiving the intent to award, excluding Saturdays, Sundays and holidays. Scrivener's error is an error in the calculation of the bid which can be documented by clear and convincing written evidence and which can be clearly shown by objective evidence drawn from inspection of the original work papers, documents, or materials used in preparation of the bid sought to be withdrawn; and the bid was submitted in good faith and the mistake was due to a calculation or clerical error, an inadvertent omission, or typographical error as opposed to an error in judgment.

C. Failure to make a timely request constitutes a waiver by the bidder of the bidder's right to claim that the mistake in his or her bid was a scrivener's error.

1.28 DISQUALIFICATION OF BIDDERS.

A. The Owner shall have the right to disqualify bids (before or after opening), which includes but is not limited to, evidence of collusion with intent to defraud or other illegal practices upon the part of the Bidder, to reject a bid not accompanied by the required bid security or by other data required by the Contract Documents, or to reject a Bid which is in any way incomplete or irregular.

B. The Owner 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 Owner. The Owner reserves the right to waive any irregularities or formalities in any solicitation or bid response. The Owner 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.

1.29 EXECUTION OF CONTRACT.

A. The successful Bidder shall be prepared, if so required by the Owner, to present evidence of experience, qualifications, and financial ability to carry out the terms of the Contract.

B. The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement Form included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance and a copy of the policies showing all endorsement, exclusions within 10 days after receipt of the Intent to Award. Failure of the Bidder to do so may result in the Bidder being rejected and could result in disqualification and forfeiture of bid bond. The owner's notice to proceed shall not be issued until the insurance policies have been reviewed and approved by the owner.

C. The successful Bidder will be required to furnish Owner with proof of insurance, as prescribed by the General Conditions and Supplementary General Conditions.

1.30 RESERVATIONS

A. The invitation to bid does not commit the Owner 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 Owner reserves the right to accept, or reject, in part or its entirety, any bid received as a result of this invitation, if it is in the best interest of the Owner to do so.

END OF SECTION

SECTION 00 3100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

EXISTING REPORTS AND SURVEYS

1.01 TOPOGRAPHIC SURVEY

A. A copy of a topographic survey with respect to the project site is included in the drawings.
   1. Title: Boundary Topographic Survey
   2. Date: 07/13/2023
   3. Prepared by: Horizon Land Surveying, LLC
   4. Drawing #: 1 of 1

B. This survey identifies grade elevations prepared primarily for the use of Brackett-Krennerich Architects in establishing new grades and identifying natural water shed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 00 4100
BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner: Poinsett County

1.02 FOR:

A. Courthouse Annex Building, Poinsett County, Harrisburg, Arkansas

1.03 DATE: _____ (Bidder to enter date)

1.04 SUBMITTED BY: (Bidder to enter name and address)

A. Bidder's Full Name _____

1. Address _____
2. City, State, Zip _____

1.05 OFFER

A. Having examined the Place of The Work and all matters referred to in the Instructions to Bidders and the Contract Documents prepared by Brackett-Krennerich and Associates, P. A. Architects for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

B. _____

(dollar amount is to be shown numerically)

C. We have included the required security Bid Bond as required by the Instructions to Bidders.

D. All applicable federal taxes are included and State of Arkansas taxes are included in the bid sum.

E. We understand that the attached Bid Form Attachment "A" – Unit Prices is made a condition of this bid.

F. We understand that the owner reserves the right to reject any and all bids and waive any informalities in the bidding.

1.06 UNIT PRICES

A. Soils Undercut:

1. If the required quantity of soils undercut is decreased or increased by Change Order, the unit price set forth below shall apply to such quantities.
2. Add or deduct soils undercut:
   Price per cubic yard _____ ($_____)
   (dollar amount to be shown numerically)
3. Undercut quantity defined on the drawings is to be in the base bid price.

1.07 ALLOWANCES

A. Allowances described in Section 01 2100 are included in the bid price.

1.08 ACCEPTANCE

A. This offer shall be open to acceptance for thirty days from the bid closing date.

B. If this bid is accepted by the Owner within the time period stated above, we will:
   1. Execute the Agreement within Ten (10) days of receipt of Notice of Award.
   2. Furnish the required bonds within Ten (10) days of receipt of Notice of Award.
   3. Commence work within Ten days after written Notice to Proceed of this bid.

C. If this bid is accepted within the time stated, and we fail to commence the Work or we fail to provide the required Bond(s), the security deposit shall be forfeited as damages to the Owner

by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

D. In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

1.09 CONTRACT TIME/ LIQUIDATED DAMAGES

A. If this Bid is accepted, we agree that the work will be complete in accordance with the contract documents and ready for Substantial Completion:

B. **Complete work by October 15, 2025.**

C. Liquidated Damages: **$200.00 (Two Hundred Dollars and 00/100)** for liquidated damages will be assessed to the contractor for liquidated damages for each calendar day that the contractor is in default after the time stipulated in the contract documents.

1.10 ADDENDA

A. The following Addenda have been received. The modifications to the Bid Documents noted below have been considered and all costs are included in the Bid Sum or price.
   1. Addendum # _____ Dated _____.
   2. Addendum # _____ Dated _____.
   3. Addendum # _____ Dated _____.
   4. Addendum # _____ Dated _____.

1.11 LISTING OF MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING WORK

A. All mechanical, plumbing, electrical and roofing work shall be listed regardless of qualifications, licensures or work amount.

B. Bidders should consult the project manual on how to fill out this form. Failure to fill out this form correctly shall cause the bid to be declared non-responsive and the bid will not receive consideration.
   1. Indicate the Name(s), License Number(s) of each entity performing the listed work and the amount:

C. MECHANICAL (Indicative of HVACR): Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

D. PLUMBING: Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

E. ELECTRICAL: Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

F. ROOFING & SHEETMETAL: Name-_____
   1. License No._____
   2. Is the amount of work $50,000 or over: Yes___ No ___

1.12 BID FORM SIGNATURE(S)

A. Company Name: _____

B. Signature: _____

C. Printed Name:_____

D. Title: _____

E. Business Address: _____

F. Contractor's License No._____

G. Seal if bid is by a corporation.

END OF BID FROM

SECTION 00 5200
AGREEMENT FORM

PART 1 GENERAL

1.01 FORM OF AGREEMENT

A. AIA Document A101 - 2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum.

B. Sample copy of Agreement Form is enclosed at the end of this section.

END OF AGREEMENT

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

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

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

Poinsett County, Arkansas
401 Market St.
Harrisburg, AR 72432

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

Courthouse Annex Building
Poinsett County
Harrisburg, Arkansas

The Architect:
(Name, legal status, address and other information)

Brackett-Krennerich & Associates, P.A.
100 E. Huntington Ave., Suite D
Jonesboro, AR 72401

The Owner and Contractor agree as follows.

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.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, 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.

TABLE OF ARTICLES

ARTICLE 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 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. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[ ] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[ ] By the following date:

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the day of the month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment. *(Federal, state or local laws may require payment within a certain period of time.)*

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. 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 of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 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.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;

.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:

(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

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

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

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

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

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

§ 6.2 Binding Dispute Resolution
For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, 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.

ARTICLE 7 TERMINATION OR SUSPENSION
§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS
§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[ ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

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

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

SECTION 00 6000

PROJECT FORMS

1.01 PROJECT FORMS INCLUDED

A. Submittal Transmittal Form

B. AIA Document G702 - 1992 Application and Certificate for Payment

C. AIA Document G703 - 1992 Continuation Sheet

D. AIA Document G701 - 2017 Change Order

E. AIA Document G704 - 2017 Certificate of Substantial Completion

F. AIA Document G706 - 1994 Contractor's Affidavit of Payment of Debts and Claims

G. AIA Document G706A - 1994 Contractor's Affidavit of Release of Liens

H. AIA Document G707 - 1994 Consent of Surety to Final Payment

I. Substitution Request Forms

END OF PROJECT FORMS

SUBMITTAL FORM

PROJECT: **PROJECT#:** **2237**	Courthouse Annex Building Poinsett County Harrisburg, Arkansas
ARCHITECT:	Brackett-Krennerich Architects P.O. Box 1655 100 E. Huntington, Suite D Jonesboro, Arkansas 72403-1655
CONSTRUCTION MANAGER/ GENERAL CONTRACTOR:	
SUBCONTRACTOR:	

SPECIFICATION DIVISION NUMBER:

SPECIFCATION SECTION NUMBER:

DESCRIPTION:

SUBMITTED: (*check one*)

- ☐ As Specified:
- ☐ Substitution for Specified Product:

If substitution, product is equal as follows:

Product differs from specifications in following ways:

CONTRACTOR'S STAMP

ARCHITECT'S STAMP

AIA® Document G702® – 1992

Application and Certificate for Payment

TO OWNER:	Poinsett County 401 Market St. Harrisburg, AR 72432	**PROJECT:**	Courthouse Annex Building Poinsett County Harrisburg, Arkansas	**APPLICATION NO:** 001 **PERIOD TO:** **CONTRACT FOR:** General Construction **CONTRACT DATE:** **PROJECT NOS:** 2237 / /	**Distribution to:** OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ FIELD: ☐ OTHER : ☐
FROM CONTRACTOR:		**VIA ARCHITECT:**	Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401		

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM		$0.00
2. NET CHANGE BY CHANGE ORDERS		$0.00
3. CONTRACT SUM TO DATE (Line 1 ± 2)		$0.00
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703)		$0.00
5. RETAINAGE:		
a. 0 % of Completed Work (Column D + E on G703)	$0.00	
b. 0 % of Stored Material (Column F on G703)	$0.00	
Total Retainage (Lines 5a + 5b or Total in Column I of G703)		$0.00
6. TOTAL EARNED LESS RETAINAGE (Line 4 Less Line 5 Total)		$0.00
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT (Line 6 from prior Certificate)		$0.00
8. CURRENT PAYMENT DUE		$0.00
9. BALANCE TO FINISH, INCLUDING RETAINAGE (Line 3 less Line 6)	$0.00	

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	$0.00	$0.00
Total approved this Month	$0.00	$0.00
TOTALS	$0.00	$0.00
NET CHANGES by Change Order		$0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of:

County of:

Subscribed and sworn to before me this day of

Notary Public:

My Commission expires:

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED $0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

AIA® Document G703® – 1992

Continuation Sheet

AIA Document G702®, Application and Certification for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.
Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO: 001
APPLICATION DATE:
PERIOD TO:
ARCHITECT'S PROJECT NO: 2237

A	B	C	D	E	F	G		H	I
			WORK COMPLETED						
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD	MATERIALS PRESENTLY STORED (NOT IN D OR E)	TOTAL COMPLETED AND STORED TO DATE (D + E + F)	% (G÷C)	BALANCE TO FINISH (C - G)	RETAINAGE (IF VARIABLE RATE)
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00%	0.00	0.00
	GRAND TOTAL	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**0.00%**	**$0.00**	**$0.00**

User Notes:

(3B9ADAAE)

AIA® Document G701® – 2017

Change Order

PROJECT: *(Name and address)* Courthouse Annex Building Poinsett County Harrisburg, Arkansas	**CONTRACT INFORMATION:** Contract For: General Construction Date:	**CHANGE ORDER INFORMATION:** Change Order Number: 001 Date:
OWNER: *(Name and address)* Poinsett County, Arkansas 401 Market St. Harrisburg, AR 72432	**ARCHITECT:** *(Name and address)* Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401	**CONTRACTOR:** *(Name and address)*

THE CONTRACT IS CHANGED AS FOLLOWS:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was	$	0.00
The net change by previously authorized Change Orders	$	0.00
The Contract Sum prior to this Change Order was	$	0.00
The Contract Sum will be increased by this Change Order in the amount of	$	0.00
The new Contract Sum including this Change Order will be	$	0.00

The Contract Time will be increased by Zero (0) days.
The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

Brackett Krennerich & Associates, P.A. **ARCHITECT** *(Firm name)*	**CONTRACTOR** *(Firm name)*	Poinsett County, Arkansas **OWNER** *(Firm name)*
SIGNATURE	**SIGNATURE**	**SIGNATURE**
Todd Welch, AIA, Vice President **PRINTED NAME AND TITLE**	**PRINTED NAME AND TITLE**	J.C. Carter, County Judge **PRINTED NAME AND TITLE**
DATE	**DATE**	**DATE**

AIA® Document G704® – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)* Courthouse Annex Building Poinsett County Harrisburg, Arkansas	**CONTRACT INFORMATION:** Contract For: General Construction Date:	**CERTIFICATE INFORMATION:** Certificate Number: 001 Date:
OWNER: *(name and address)* Poinsett County, Arkansas 401 Market St. Harrisburg, AR 72432	**ARCHITECT:** *(name and address)* Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401	**CONTRACTOR:** *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.
(Identify the Work, or portion thereof, that is substantially complete.)

Brackett Krennerich & Associates, P.A.		Todd Welch, AIA, Vice President	
ARCHITECT *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE OF SUBSTANTIAL COMPLETION**

WARRANTIES
The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:
(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED
A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:
(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within ( ) days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: $

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:
(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE**
Poinsett County, Arkansas		J.C. Carter, County Judge	
OWNER *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE**

AIA® Document G706® – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)* Courthouse Annex Building Poinsett County Harrisburg, Arkansas	**ARCHITECT'S PROJECT NUMBER:** 2237 **CONTRACT FOR:** General Construction	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐
TO OWNER: *(Name and address)* Poinsett County, Arkansas 401 Market St. Harrisburg, AR 72432	**CONTRACT DATED:**	

STATE OF:
COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☒ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G706®A – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)* Courthouse Annex Building Poinsett County Harrisburg, Arkansas **TO OWNER:** *(Name and address)* Poinsett County, Arkansas 401 Market St. Harrisburg, AR 72432	**ARCHITECT'S PROJECT NUMBER:** 2237 **CONTRACT FOR:** General Construction **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐

STATE OF:
COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY: _____
(Signature of authorized representative)

_____
(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:
My Commission Expires:

AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* Courthouse Annex Building Poinsett County Harrisburg, Arkansas	**ARCHITECT'S PROJECT NUMBER:** 2237 **CONTRACT FOR:** General Construction	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐
TO OWNER: *(Name and address)* Poinsett County, Arkansas 401 Market St. Harrisburg, AR 72432	**CONTRACT DATED:**	SURETY: ☐ OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, OWNER,

as set forth in said Surety's bond.

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

_____
(Surety)

_____
(Signature of authorized representative)

Attest:
(Seal):

_____
(Printed name and title)

BRACKETT KRENNERICH architects

SUBSTITUTION REQUEST FORM

To: _____

_____

Project: _____

_____

_____

Commission Number: _____

Date Received: _____

Specification Section Title/Number/Paragraph: _____

Drawing/Details Affected: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Product Description: _____

Differences between proposed substitution and specified product: _____

_____

_____

WHY IS SUBSTITUTION BEING SUBMITTED? (SELECT 1 OF THE FOLLOWING):

☐ Pre-Bid Substitution (Prior Approval): Included detail analysis comparing proposed substitution against specified product, including redlined specification section showing differences.

☐ Specified product is not available. Explain in detail, use attached letter.

☐ Cost savings to Owner. Indicate cost analysis as attachment.

☐ Other. Explain

EFFECTS OF PROPOSED SUBSTITUTION

Answer the following questions and attach explanations.

1. Attach list of at least 3 projects where proposed substitution has been used within past 12 months include Name, address, and telephone number of Owner and Architect.
   (attachment included) (attachment not included, explain)
2. Does substitution affect dimensions indicated on Drawings?
   (No) (Yes, explain)
3. Does substitution affect work of other sections?
   (No) (Yes, explain)
4. Does substitution require modifications to design, changes to drawings, or revisions to specifications?
   (No) (Yes, explain)

CONTRACTORS'S/BIDDER'S REPRESENTATION

Undersigned accepts responsibility for coordination of proposed substitution and accepts all additional costs resulting from the incorporation of proposed substitutions into the Project per Section 01 6300. A request for substitution constitutes a representation that the Contractor/Bidder has investigated the proposed product and determined that it is equal to or superior in all respects to specified product.

The only response to this Request for Substitution will be by Addendum (if prior to award) or Supplemental Instruction (if after award, unless Change Order is necessary to reduce Contract Amount).

Submitted by: _____

Name: _____

Address: _____

_____

Telephone: _____

Contact person of manufacturer/supplier of proposed substitution: _____

Subcontractor's signature and date: _____

Contractor's signature and date: _____

ARCHITECT'S REVIEW AND ACTION

- ☐ Substitution approved
- ☐ Substitution not approved
- ☐ No Action Required
- ☐ Submission Incomplete, not accepted
- ☐ Submission Too Late for Consideration

Reviewed by: _____ _____ Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E

☐ Other _____

_____

_____

_____

_____

_____

_____

_____

SECTION 00 7200

GENERAL CONDITIONS

1.01 FORM OF GENERAL CONDITIONS

A. AIA Document A201 – 2017 General Conditions of the Contract for Construction, included herewith, is the General Conditions between the Owner and Contractor.

B. The AIA General Conditions and Supplementary Conditions Section 00 7300 of these specifications shall form part of the contract and apply to the contractor and all subcontractors alike.

1.02 SUPPLEMENTARY CONDITIONS

A. Refer to Section 00 7300 for amendments to these General Conditions.

2.01 RELATED REQUIREMENTS

A. Section 00 7300 – Supplementary Conditions.

END OF DOCUMENT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

Courthouse Annex Building
Poinsett County
Harrisburg, Arkansas

THE OWNER:
(Name, legal status and address)

Poinsett County, Arkansas
401 Market St.
Harrisburg, AR 72432

THE ARCHITECT:
(Name, legal status and address)

Brackett Krennerich & Associates, P.A.
100 E. Huntington Ave., Suite D
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.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

TABLE OF ARTICLES

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(Topics and numbers 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 enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal 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.

§ 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 and intangible 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. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 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.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 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 retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and 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 the 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 suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, 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 suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon written protocols governing the transmission and use of, and reliance on, Instruments of Service or any other information or documentation in digital form.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to written protocols governing the use of, and reliance on, the information contained in the model shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 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.

§ 2.3.2 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.

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

§ 2.3.4 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.

§ 2.3.5 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.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 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.

§ 2.5 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 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 default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for 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. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor 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 its 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 2.3.4, 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, unless otherwise specifically provided in the Contract Documents.

§ 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 submit 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, subject to Section 15.1.7, 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. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be 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 notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 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 approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 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 Construction Change Directive.

§ 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

§ 3.5.1 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 of the Work the Contract Documents require or permit. 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.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 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 Documents 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 and in no event later than 14 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 that an equitable adjustment be made 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, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters 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 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.

§ 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.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 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.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of 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 make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and 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 how 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 4.2.7. 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 and coordinated 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 the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect 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 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.

§ 3.12.10.1 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 be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately 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 and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and 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.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 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, 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. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 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 construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its 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 and rubbish caused by 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 the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with 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 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 an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the 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 that 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 Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 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.

§ 4.2 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.

§ 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 promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) 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.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 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.

§ 4.2.6 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 13.4.2 and 13.4.3, whether or not the 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, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 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 in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness 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 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.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order 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.

§ 4.2.9 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.

§ 4.2.10 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 Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 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.

§ 4.2.12 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.

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

§ 4.2.14 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. 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 the 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, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice 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 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. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

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

§ 5.3 Subcontractual Relations

By appropriate written agreement, 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, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. 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, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. 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; 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 assignment to the Owner under this Section 5.4, the Owner 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 term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 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 any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its 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 or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has 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 notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for 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 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 that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor 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 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. The Contractor shall proceed promptly with changes in the Work, 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 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 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine 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 7.3.4 shall be limited to the following:

- **.1** Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- **.2** Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of 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, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 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.

§ 7.3.7 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.

§ 7.3.8 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 may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

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, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 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 (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 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

§ 9.1.1 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.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent 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. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and 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 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 agreed upon in writing. 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, suppliers, or other persons or entities that 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 (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole 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 in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. 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. 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 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 suppliers 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 either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 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 pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the 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 Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and 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 and suppliers 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 or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 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.

§ 9.6.7 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 or provided by 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, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 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' 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 shutdown, 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; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and 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 the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the 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 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 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. 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 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, (3) a written statement that the Contractor knows of no 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, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and 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, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance 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 the lien, claim, security interest, or encumbrance, 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, corrected, 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 the 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;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a 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 all 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, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; 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 implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

§ 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. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is 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, notice of the 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 and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. 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 notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's 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 the material or substance or who are to perform the task of removal or safe containment of the 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 by the amount of the Contractor's reasonable additional costs of shutdown, 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 hazardous 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 hazardous 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 reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances 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 by a government agency 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 reimburse 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 Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 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.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the

procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 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; (2) the Architect and Architect's consultants; and (3) Separate Contractors, 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 those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 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, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement 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 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

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 Architect's request or to 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, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before 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.

§ 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 any 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 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 2.5.

§ 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 of the Owner or Separate Contractors, whether completed or partially completed, 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, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. 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. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 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.

§ 13.3.2 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 thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 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 tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 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 13.4.1, 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 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 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.

§ 13.4.4 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.

§ 13.4.5 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.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties 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.

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, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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 reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work 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' 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 or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.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 reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner 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' 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, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.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 Initial Decision Maker, 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 under 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 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 Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

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, payment of money, a change in the Contract Time, 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. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the 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 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall 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.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 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.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 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.

§ 15.1.6.2 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.

§ 15.1.7 Waiver of 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 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 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 15.1.7, 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 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 court order. 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 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 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. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. 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 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party 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 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party 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 those of the Owner and Contractor under this Agreement.

SECTION 00 7300
SUPPLEMENTARY CONDITIONS

PART ONE GENERAL

1.01 INTENT

A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 and other provisions of the Contract Documents as indicated below.

B. All provisions which are not so amended or supplemented remain in full force and effect.

C. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.02 MODIFICATIONS TO AIA A201 - 2017

A. ARTICLE 1 - GENERAL PROVISIONS
   1. FORM OF AGREEMENT
      a. 1.1., Basic Definitions, add the following subparagraph:
         1) 1.1.1.2, The form of agreement between owner and contractor shall be as defined in Section 00 5200 of the specifications.
   2. 1.1.5 THE DRAWINGS
      a. List of drawings are enumerated in Section 00 0115 of the specifications.

B. ARTICLE 2 - OWNER
   1. Delete 2.1.2 entirely.
   2. Delete 2.2.1 entirely.
   3. Delete 2.3.3 entirely.

C. ARTICLE 3 – CONTRACTOR
   1. LABOR AND MATERIALS
      a. Refer to the following paragraphs:
         1) No. 3.4 - Labor and Materials
         2) No. 3.6 - Taxes
         3) No. 3.7 - Permits, Fees, Notices and Compliance with Laws.
         4) No. 3.13 - Use of Site
      b. See Specifications Section 01 1100, Summary of Work, for additional provisions on these subjects.
   2. CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULES
      a. Refer to Section 3.10; See Specifications Section 01 3216, Construction Schedules, for additional provisions on this subject.
   3. DOCUMENTS AND SAMPLES AT THE SITE
      a. Refer to Section No. 3.11, Documents and Samples at the Site:
      b. See Specifications Section 01 7839, Project Record Documents, for additional provisions on this subject.
   4. SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
      a. Refer to Section No. 3.12, Shop Drawings, Product Data, and Samples
      b. See Specifications Section 01 3323, Submittals, for additional provisions on this subject.
   5. CUTTING AND PATCHING WORK
      a. Refer to Section 3.14, Cutting and Patching:
      b. See Specifications Section 01 7329, Cutting and Patching, for additional provisions on this subject.
   6. CLEANING
      a. Refer to Section 3.15, Cleaning Up
      b. See Specifications Section 01 7400, Cleaning, for additional provisions on this subject.

7. ACCESS TO WORK
   a. Add the following paragraph:
      1) 3.16.1 Inspection: The contractor awarded this project agrees to allow any Federal or State Inspector, acting in their official capacity, to have access to the jobsite.

D. ARTICLE 5 - SUBCONTRACTS
   1. Refer to 5.2.1 and add the following subparagraph:
      a. 5.2.1.1, See Section 00 2100, of the specifications for additional requirements for subcontractors

E. ARTICLE 7 - CHANGES IN THE WORK
   1. CHANGE ORDERS
      a. 7.2.1, Delete in its entirety and substitute the following:
         1) 7.2.1, The contractor shall present an itemized accounting together with appropriate supporting data for the purposes of considering additions or deductions. Supporting data shall include but is not limited to the following:
            (a) costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and worker or workmen's compensation insurance;
            (b) costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
            (c) rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
            (d) costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
            (e) additional costs of supervision and field office personnel directly attributable to the change.
            (f) The value of all such additions and deductions shall then be computed as set forth in Paragraph 'D'.
         2) The burden of proof of cost rests upon the Contractor. Contractor shall be required, if called upon, to furnish the original bills and payrolls and support the statement with proper affidavits. Burden of proof of costs is upon the general contractor.
         3) 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 owner unless expressly stated and agreed to in writing executed by the owner.
      b. 7.2.1.2 Compute requests for changes be they additions or deductions as follows:
         1) For work directly performed by the General Contractor or a Subcontractor:
            (a) Net cost of material----------a
            (b) State Sales Tax ----------b
            (c) Net Placing cost----------c
            (d) W.C. Insurance Premium and FICA Tax---------d
               (1) Subtotal----------a+b+c+d
            (e) Overhead and profit, 12% X (a+b+c+d)----------e
            (f) Allowable Bond Premium (if applicable)----------f
               (1) TOTAL COST----------a+b+c+d+e+f
         2) Credit for work omitted shall be computed as outlined in (1) "a through e" except the General Contractor or Subcontractor's share of overhead and profit percentage is 7%.
         3) For work performed by Subcontractors the General Contractor Shall:
            (a) Subcontractors shall compute their work as outlined in (1) "a through e". To the cost of that portion of the work (change) that is performed by the subcontractor, the general contractor shall add an overhead and profit charge of Five (5%) percent plus the allowable bond premium.

2. CONSTRUCTION CHANGE DIRECTIVES
   a. Delete 7.3, Construction Change Directives, 7.3.1 through 7.3.10 in its entirety. Changes of work may only be accomplished through the change order process.
   b. Delete reference to construction change directive in paragraph 7.1.2. All changes to work are to be through change order process.

F. ARTICLE 9 - PAYMENTS AND COMPLETION
1. Refer to Section 9.2, Schedule of Values:
   a. See Specifications Section 01 2973 Schedule of Values, for additional provisions on this subject.
2. PAYMENTS TO CONTRACTOR
   a. 9.3 Applications for Payment, add the following subparagraphs:
      1) 9.3.2.1, Act 193 of 2009 amended Arkansas Code Annotated 22-9-604 (a) concerning withholding of retention proceeds in a construction contract, provides that payment to the contractor be as follows:
         (a) Ninety Five percent (95%) of the value of labor executed will be paid to the contractor by the owner in monthly installments as work progresses in proportion to the amount of work executed during monthly period less previous payments. Five percent (5%) will be retained by the owner until final payment. One hundred percent (100%) of all materials delivered and stored on the premises or materials stored in a bonded warehouse approved by the owner will be paid monthly with pay requests
   b. 9.3.2.2, Arkansas Code Annotated 22-9-501, makes provisions for the contractor to withdraw before completions of the project, the retainage withheld by the owner upon deposit of approved government bonds.
3. Add to Subparagraph 9.3.1, Applications for Payment, the following sentence:
   a. The form of Application for payment shall be AIA Document G-702, Application and Certification for Payment, supported by AIA Document G-703, Continuation Sheet.

4. CERTIFICATES FOR PAYMENT
   a. 9.4.1, Add the following:
      1) 9.4.1.1, Deliver three (3) copies of monthly estimates to architect on form to be provided by the architect.
      2) 9.4.1.2, The contractor shall promptly pay each subcontractor, upon receipt of payment from the owner, out of the amount paid to the contract on account of said subcontractor's work. The contractor shall require each subcontractor to make payments to his subcontractors in similar manner. Failure to promptly pay subcontractors shall be cause to call upon the contractor's payment bond for relief.
      3) 9.4.1.3, The owner shall make final payment within 30 days of completion and acceptance of the work. In the event the project extends beyond 30 days, periodic payments shall be made.
5. PAYMENT WITHHELD
   a. 9.5, Decisions to Withhold Certification, add the following subparagraph:
      1) 9.5.1.1, The Owner may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in its opinion to protect the owner from loss because of:
         (a) When periodic payments are made five percent (5%) will be withheld.
         (b) Defective work not remedied;
         (c) Third party claims filed or reasonable evidence indicating probable filing to such claims;
         (d) Failure of the contractor to make payment properly to subcontractors or for labor, materials or equipment;
         (e) Reasonable evidence that the work cannot be completed for the unpaid balance of the contract sum;
         (f) Damage to the owner or another contractor;

(g) Reasonable evidence that the work will not be completed within the contract time; or
(h) Persistent failure to carry out the work in accordance with the contract documents.

6. FAILURE OF PAYMENT
   a. Delete 9.7 entirely.
7. FINAL COMPLETION AND FINAL PAYMENT
   a. Add to 9.10.2:
      1) Forms for "Consent of Surety for Final Payment" and "Contractor's Affidavit of Payment of Debts and Claims," are included at the end of Section 00 6000 1, Project Forms. These forms are required to be submitted to the owner with other close-out documents prior to final payment.

G. ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY
   1. Delete 10.3.3 entirely.
   2. Delete 10.3.6 entirely.

H. ARTICLE 11 - INSURANCE AND BONDS
   1. CONTRACTOR'S INSURANCE AND BONDS
      a. 11.1.1, In the first line following the word "maintain", insert the words "in a company or companies to which the owner has no reasonable objection".
      b. 11.1.1, Add the following new subparagraph:
         1) 11.1.1.2, Liability insurance should include all major divisions of coverage and be on a comprehensive general basis including:
            (a) Premises - Operation (including X-C-U)
            (b) Owner's and Contractor's Protective
            (c) Products and Completed Operations
            (d) Contractual - Including specific provision for the contractor's obligation under Paragraph 11.1.
            (e) The contractor shall purchase from and maintain 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 completed operations under the Contract:
            1) Claims under worker's compensation, disability benefit and other similar employee benefit acts that 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 sue 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.
         2) 11.1.1.3, The insurance required by Subparagraph 11.1.1 and 11.1.1.2 shall be written for not less than any limits of liability required by law or by those set forth below, whichever is greater, and shall include contractual liability insurance as applicable to the contractor's obligations.
            (a) Workman's Compensation - Employer's Liability Limits of $500,000/$500,000/$500,000
            (b) General Liability - $1,000,000 Per Occurrences/$2,000,000 Aggregate

(c) Automobile Liability - A single combined limit for both bodily injury and property damage of $1,000,000 or Per Person/Per Occurrence
(d) Commercial Umbrella Liability - $1,000,000

c. 11.1.4, Add new subparagraph:
1) 11.1.4.1, Furnish in triplicate certificates herein as called for and specifically set forth evidence of all coverage required by 11.1.1,11.1.1.2, and 11.1.2 and the contractor shall furnish to the architect copies of any endorsements that are subsequently issued amending coverage or limits. Certificate of insurance shall be presented on AIA Document G-705, showing that all required insurance is in force before starting any contract work.

2. OWNER'S INSURANCE
a. Delete Article 11.2 entirely.

3. PROPERTY INSURANCE
a. 11.3.1 omit the word owner; replace with contractor
b. Builder's Risk:
1) Add 11.3.1.3 as follows: The contractor shall effect and maintain Builder's Risk insurance as the interest of the owner and contractor may appear. Said insurance shall be written as an all risk coverage or special perils. The coverage shall contain no limitations for earth movement. Insurance shall include theft coverage.
(a) Note: Owner assumes liability for maximum of 10% deductible for earthquake coverage only.
2) Limitations of flood coverage shall not include subsurface pressure or seepage. Faulty workmanship language shall not exclude ensuing loss.
c. 11.3.1.2 delete in its entirety.
d. 11.3.4 delete in its entirety.
e. 11.3.5 delete in its entirety.

4. PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND
a. Refer to Section 11.1., Contractor's Insurance and Bonds
b. Add the following:
1) 11.1.3.1, A successful bidder shall furnish a Performance and Payment bond within 10 days after receipt of the Intent to Award notice. Failure to furnish the required bonds may cause forfeiture of bid guarantee to the owner as liquidated damages.
(a) The Contractor shall furnish a "Performance and Payment Bond" in the amount equal to 100% of the contract price as security for the faithful performance of this contract and for payment of all indebtedness for labor and materials furnished or performed in connection with this contract. The bond shall be written by a surety company which is qualified and is authorized to do business in the State of Arkansas and must be executed by a resident local agent who shall be entitled to full commission paid local agents and who is licensed by the Insurance Commissioner to represent the surety company executing said bond and filing with said bond, his power of attorney as his authority. The mere countersigning of a bond will not be sufficient. The bond shall be written in favor of the Owner and executed. An original and two (2) copies of the bond must be furnished, with power of attorney attached to each. The contractor shall file (not record) the original with the Clerk in the Circuit Court of the County in which the work is to be performed is located. The contractor is to pay all expense incidents to the filing of 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 architect for distribution.

I. ARTICLE 14 - TERMINATION OR SUSPENSION OF CONTRACT
1. Delete 14.1.3 entirely and insert the following:

a. If the Owner substantially breaches an obligation in 14.1.1 or 14.1.2 of this Contract, following seven days' written notice to the Owner, the Contractor may terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment, tools, construction equipment and machinery, including reasonable overhead, profit and damages for work performed.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 1100
SUMMARY OF THE WORK

PART 1 - GENERAL

1.01 WORK COVERED BY THE CONTRACT DOCUMENTS

A. These specifications shall cover entirely all of the labor and material requirements for the project. The General Conditions of the Contract, Supplementary Conditions, Instructions to Contractor, and any Addenda issued by the architect are hereby made a part of each division or section of these specifications as if bound, repeated, or included therein.

B. In the interest of clarity and brevity, phrases such as "The contractor shall ..." or "The contractor shall furnish and install ..." have been omitted from these specifications.

C. The General Construction Contract shall include all construction work required to complete the total project in accordance with requirements of the contract documents and shall include all heating, air conditioning, ventilating, electrical, and mechanical.
   1. Scope of individual bid packages/contracts to be as defined by the Construction Manager.

D. Contractor's Duties:
   1. Except as specifically noted, provide and pay for:
      a. Labor, materials, and equipment
      b. Tools, construction equipment, and machinery
      c. Water, heat, and utilities required for construction
      d. Transportation and other facilities and services necessary for proper execution and completion of work
   2. Pay all legally required sales, consumer, and use taxes.
   3. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
      a. Permits
      b. Government fees
      c. Licenses
   4. Give required notices.
   5. Comply with laws, codes, ordinances, rules, regulations, orders, and other legal requirements of public authorities which bear on the performance of work.
   6. Promptly submit written notice to the architect and engineer of observed variance of contract documents from legal requirements. It is not contractor's responsibility to make certain that drawings and specifications shall comply with codes and regulations.
      a. Appropriate modifications to contract documents will adjust necessary changes.
      b. Assume responsibility for work known to be contrary to such requirements without notice.
   7. Enforce strict discipline and good order among the employees. Do not employ on work:
      a. Unfit persons
      b. Persons not skilled in assigned work tasks

1.02 CONTRACTOR USE OF PREMISES

A. Confine operations at site to areas permitted by law, ordinances, permits, and contract documents.

B. Do not unreasonably encumber site with materials or equipment.

C. Assume full responsibility for protection and safekeeping of products stored on premises.

D. Move any stored products which interfere with operation of owner or other contractor.

E. Materials may be stored in approved off-site areas when properly insured in the owner's interest.

1.03 NO SMOKING POLICY

A. Pursuant to the Arkansas Code Annotated § 6-21-609, the Owner has a No Smoking Policy on all properties owned or leased by the Owner.

B. It is the policy of the Owner that all uses of tobacco and tobacco products, including smokeless tobacco, will be prohibited on all properties.

C. This policy applies to all Staff Members, Visitors, General Contractors, Subcontractors, and Vendors. This policy is strictly enforced without exception.

1.04 WORK SEQUENCE / PHASING

A. The contractor is to perform all construction and contract work within the limits of the site at the contractor's schedule.

B. All work shall be performed at the contractor's schedule and within contract time.

C. Any work that requires the interruption of the utility service to any existing building is to be coordinated and scheduled with the owner prior to beginning the work.

D. Any work that is to be completed outside the site is to be coordinated with the owner prior to beginning work.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

Section 01 1115

ITEMS FURNISHED BY OWNER

PART 1 GENERAL

1.01 SCOPE

A. The General Contractor is advised to pay special attention to notes on the plans and specifications indicating items to be "by owner", "owner furnished", owner furnished/owner installed (O.F.O.I.)", "owner furnished/contractor installed (O.F.C.I.)". and "not in contract (N.I.C.)".

B. Not in Contract (N.I.C.) - indicates that those items are not included in the construction contract.

C. By Owner, Owner Furnished, and Owner Furnished/Owner Installed - indicates those items that will be furnished and delivered to the site by the owner or his agents and are to be installed by the owner's representatives or subcontractors.

D. Owner Furnished/Contractor Installed - indicates those items that will be furnished and delivered to the site by the owner or his agents and are to be installed by the contractor.

E. The following list of items are Owner Furnished/Owner Installed: (Unless indicated with (O.F.C.I.) designation).

F. General:
   1. Loose furniture (tables, filing cabinets, shelving, etc. not indicated on plans or in specifications) Seating at courtroom and quorum court.
   2. Security Cameras & CCTV (Vigilant); Building Security System
   3. Audio Equipment
   4. Video Projectors
   5. Television Monitors and Supports
   6. Phone System
   7. Data Server
   8. Computer network system including low voltage cabling, network cabling, IT rack, and patch panels, telephone line, coax (RG6) cabling connections, testing and support devices. access point (wifi) antennas
   9. Window Treatments (blinds, curtains, etc.)
   10. Toilet Accessories (toilet paper holder, towel dispensers, soap dispensers) (OFCI)

1.02 COORDINATION

A. The contractor is to assist the owner in rough-in preparation for owner furnished and installed equipment and allow timely access to the work for installation.

B. The contractor, mechanical contractor, and electrical contractor will be responsible for hook up of all kitchen equipment. Rough-in drawings will be provided by the kitchen supplier.

END OF SECTION

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cash allowances.

1.02 RELATED REQUIREMENTS

A. Section 01 2976 - Progress Payment Procedures: Additional payment and modification procedures.

1.03 CASH ALLOWANCES

A. Costs Included in Cash Allowances: Cost of product to contractor or subcontractor, including applicable trade discounts, cost of delivery to site, applicable taxes.

B. Architects Responsibilities:
   1. Consult with contractor for consideration and selection of products, suppliers, and installers.
   2. Select products in consultation with owner and transmit decision to contractor.
   3. Prepare Change Order.

C. Contractor's Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   3. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
   4. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.

D. Differences in costs will be adjusted by Change Order.

1.04 ALLOWANCES SCHEDULE

A. Section 04 2000: Include the stipulated sum of **$750.00 (per thousand)** for purchase and delivery of face brick.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2973
SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 GENERAL

A. Submit to the architect/engineer schedule of values, at least ten (10) days prior to submitting first Application for Payment.

B. Upon request by architect/engineer, support values given with data that will substantiate their correctness.

C. Submit quantities of designated materials.

D. Payment for materials stored on site will be limited to those materials listed in Schedule of Unit Material Values.

E. Use Schedule of Values only as basis for contractor's Application for Payment.

1.02 FORM OF SUBMITTAL

A. Submit typewritten Schedule of Values on 8-1/2" x 11" white paper.

B. Use Table of Contents of this specification as basis for format for listing costs of work for each of the sections from all divisions.

C. Identify each line item with number and title as listed in Table of Contents of this specification (sections).

1.03 PREPARING SCHEDULE OF VALUES

A. Itemize separate line item cost for each of the following general cost items:
   1. Performance and Payment Bonds
   2. Field Supervision and Layout
   3. Temporary Facilities and Controls

B. Itemize separate line item cost for work required by each section of this specification.

C. Breakdown installed cost into:
   1. Delivered cost of product, with taxes paid
   2. Installation cost

D. For each line item which has installed value of more than 1%, break down costs to list major products or operations under each item.

E. Round off figures to nearest dollar.

F. Make sum of total costs of all items listed in schedule equal to total contract sum.

1.04 PREPARING SCHEDULE OF UNIT MATERIAL VALUES

A. Submit separate Schedule of Unit Prices for materials to be stored on which progress payments will be made.

B. Make form of submittal parallel to Schedule of Values, with each line item identified same as line time in Schedule of Values.

C. Include in unit prices only:
   1. Cost of material
   2. Delivery and unloading at site
   3. Sales taxes

D. Make sure that unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

1.05 REVIEW AND RESUBMITTAL

A. After review by architect/engineer, revise and resubmit Schedule (and Schedule of Material Values) as required.

B. Resubmit revised Schedule in same manner.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01 2976
PROGRESS PAYMENT PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Application for payments

B. Defect Assessment

1.02 RELATED SECTIONS

A. Section 00 7300 - 1.02,G, 3, Payments to Contractor

B. Section 01 2973 - Schedule of Values

C. Section 00 6000 - Project forms

1.03 APPLICATIONS FOR PAYMENT

A. Submit four (4) copies of each application on Owner-accepted form to Owner (all copies require original signatures in blue ink).

B. Content and Format: Utilize Schedule of Values for listing items in Periodic Pay Estimate.

C. Submit an updated construction schedule with each Periodic Pay Estimate.

D. Payment Period: Progress payments to be made monthly.

E. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question.

1.04 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect/Engineer and Owner it is not practical to remove and replace the Work, the Architect/Engineer will direct an appropriate remedy or adjust payment.

C. The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.

D. The defective Work will be partially repaired to the instructions of the Architect/Engineer, and the unit sum/price will be adjusted to a new sum/price at the discretion of the Owner.

E. The authority of the Owner to assess the defect and identify payment adjustment is final.

F. Non-Payment For Rejected Products: Payment will not be made for rejected products 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.

PART II—PRODUCTS

2.01 NOT USED.

PART III—EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 3113
COORDINATION

PART 1 - GENERAL

1.01 EXAMINATION

A. Each contractor, subcontractor, or supplier shall thoroughly examine the drawings and specifications pertaining to separate contracts and include in his base bid those items for which he will be responsible and for the proper coordination of the work to be performed.

1.02 TRANSITIONS

A. The architect accepts no responsibility for the naming of every item that may be needed to make transitions from the work of one contractor to another. All such transitions shall be the entire responsibility of the contractor, subcontractor, and materials and equipment suppliers involved.

1.03 SCHEDULES

A. General contractor shall coordinate the scheduling of all work.

1.04 LOCATION OF WORK

A. The contractor shall check and verify all measurements and dimensions shown on contract drawings and shop drawings of all the work as it progresses.

B. The proper location of work of all subcontractors, including supports for equipment, shall be the final conclusive responsibility of the general contractor regardless of who is responsible for the layout of the work in the first instance.

1.05 UNLOADING AND HOISTING MATERIALS

A. The contractor, each subcontractor, and each supplier of materials and equipment shall be responsible for the hoisting of their materials and equipment to the proper location for installation in the project.

B. They shall also be responsible for unloading of all materials and equipment at the job site.

1.06 STORAGE OF MATERIALS

A. General contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and equipment and coordinate the storage and execution of their work with his.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 01 3119
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. See Section 00 2100 – Instructions to Bidders for Pre-Bid Conference.

B. Preconstruction Meeting

C. Progress Meetings

D. Pre-installation Meetings

1.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required: Owner, Architect, Contractor, Contractor's Superintendent, and major subcontractors.

C. Agenda:
   1. Designation of personnel representing the parties in Contract and the Architect.
   2. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   3. Scheduling.
   4. Use of premises by Owner and Contractor.
   5. Owner's requirements.
   6. Construction facilities and controls provided by Owner.
   7. Temporary utilities.
   8. Security and housekeeping procedures.
   9. Procedures for testing.
   10. Maintaining record documents.
   11. Inspection and acceptance of equipment put into service during construction.

D. General Contractor is to record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, and those affected by decisions made.

1.03 PROGRESS MEETINGS

A. The General Contractor is to schedule and administer meetings throughout progress of the Work.
   1. Progress meetings to be held monthly until the project is eighty percent complete.
   2. After projection completion reaches eighty percent, progress meetings are to be held every two weeks.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems which 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, and those affected by decisions made.

1.04 PREINSTALLATION MEETING

A. When required in individual specification sections, the General Contractor is to 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 four (4) days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of installation, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two (2) days after meeting to participants, with two copies to architect, owner, participants, and those affected by decisions made.

PART 2-PRODUCTS

NOT USED.

PART 3-EXECUTION

NOT USED.

END OF SECTION

SECTION 01 3216
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 SCHEDULE

A. Prepare and submit for architect's approval a projected construction schedule for the entire work.

B. The schedule shall indicate the dates for the starting and completion of various stages and sequence of construction and shall be revised monthly. Submit with contractor's Application for Payment each month.

1.02 FORM

A. Prepare schedule in the form of a horizontal bar chart providing:
   1. Separate horizontal bar column for each major specification section.
   2. Place in chronological order of beginning of each item of work.
   3. Identify each horizontal bar:
      a. By major specification section
      b. By distinct graphic delineation
   4. Horizontal time scale (weeks)
   5. Allow space for denoting of actual progress of the work.
   6. Minimum sheet size: 8-1/2" x 14"

1.03 SCHEDULE UPDATE

A. Update schedules accurately indicating the progress to first day of each month and submit monthly with Application and Certificate for Payment. Updated schedules are to be distributed at monthly progress meetings to all attendees.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END OF SECTION

SECTION 01 3223
SURVEY AND LAYOUT DATA

PART 1 – GENERAL

1.01 RELATED SECTIONS

A. Section 00 3100 - Available Project Information

1.02 FIELD ENGINEERING

A. Employ a land surveyor registered in the State of Arkansas and acceptable to Architect.

B. Contractor shall locate and protect survey control and reference points. Promptly notify architect of any discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify set-backs and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit a copy of certificate signed by land surveyor that the elevations and locations of the work are in conformance with the contract documents.

G. Maintain a complete and accurate log of control and survey work as it progresses.

PART 2 – PRODUCTS

2.01 NOT USED.

PART 3 – EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 3323
SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project Data
B. Shop Drawings
C. Samples
D. Design Data
E. Test Reports
F. Certificates
G. Manufacturer's Instructions
H. Manufacturer's Field Reports
I. Erection Drawings

1.02 RELATED SECTIONS

A. Section 00 6000 - Project Forms

1.03 PROJECT DATA

A. Manufacturer's standard schematic drawings:
   1. Modify drawings to delete information which is not applicable to project
   2. Supplement standard information to provide additional information applicable to project
B. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, and other standard descriptive data
   1. Clearly mark each copy to identify pertinent materials, products, or models
   2. Show dimensions and clearances required
   3. Show performance characteristics and capacities
   4. Show wiring diagrams and controls

1.04 SHOP DRAWINGS

A. Original drawings, prepared by contractor, subcontractor, supplier, or distributor, which illustrate some portion of the work; showing fabrication, layout, setting, or erection drawings.
   1. Prepared by a qualified detailer
   2. Identify details by reference to sheet and detail numbers shown on contract document drawings
   3. Minimum sheet size: 8-1/2" x 11"

1.05 SAMPLES

A. Physical examples to illustrate materials, equipment, or workmanship, and to establish standards by which completed work is judged.
   1. Office Samples: of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of product or material with integrally related parts and attachment devices
      b. Finishes

1.06 DESIGN DATA

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the owner.
B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.07 TEST REPORTS

A. Submit for the Architect/Engineer's knowledge as contract administrator or for the owner.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.08 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect/Engineer.

1.09 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to Architect/Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the architect/engineer's benefit as contract administrator or for the owner.

B. Submit report in duplicate within 30 days of observation to architect/engineer for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

PART 2—PRODUCTS

2.01 Not Used.

PART 3—EXECUTION

3.01 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings, project data, and samples prior to submission.

B. Verify:
   1. Field measurements
   2. Field construction criteria
   3. Catalog numbers and similar data
   4. Conformance with Contract Documents
   5. Coordination with other work.

C. Coordinate each submittal with requirements of work, construction schedule, and of contract documents.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by architect/engineer's review of submittals.

E. Contractor's responsibility for deviations in submittals from requirements of contract documents is not relieved by architect/engineer's review of submittals, unless architect/engineer gives written acceptance and deviations are clearly marked on submittals.

F. Notify architect/engineer in writing at time of submission of deviations in submittals from requirements of contract documents.

G. Begin no work which requires submittals until return of submittals with architect/engineer's stamp and initials or signature indicating review.

H. Contractor is responsible for delays caused by improper submittal procedures or incomplete submittals.

3.02 SUBMISSION REQUIREMENTS

A. Schedule submissions at least 14 working days before dates reviewed submittals will be needed.

B. Each submittal shall be complete and accurate.

C. Accompany submittals with a completed Submittal Transmittal Form containing the information shown in the sample form in Section 00 6000. A separate transmittal form is required for each required submittal.

D. Incomplete or partial submittals will be rejected, without review, and require resubmittal.

E. Submittals may be made of portions of the Work, but each Submittal shall be complete with respect to the information necessary for proper review by Architect and their consultants.

F. Cross out non-related material in the submittal.

G. Submittals shall be sent electronically to the Architect. This document will be stored electronically at the project site for Architect and Contractor access during construction. All documents shall be sent in PDF format and saved in the following method SD_03_3000_01.PDF. Each Shop Drawing shall have specification number and the submittal number for that specification section. The file above indicates specification section 03 3000 submittal number one. Upon completion of the project the contractor is to submit four copies on CD of all Shop Drawings during the project closeout phase. These shall be in PDF format.

H. Submit number of samples specified in each of specifications sections.

I. Accompany submittals with transmittal letter, in duplicate, containing:
   1. Date
   2. Project title and number
   3. Contractor's name and address
   4. The number of each shop drawing, project data, and sample submitted
   5. Notification of deviations from contract documents
   6. Other pertinent data

J. Submittals shall include:
   1. Date and revision dates
   2. Project title and number
   3. The names of:
      a. Architect/Engineer
      b. Contractor
      c. Subcontractor
      d. Supplier
      e. Manufacturer
      f. Separate detailer when pertinent
   4. Identification of product or material
   5. Relation to adjacent structure or materials
   6. Field dimensions, clearly identified as such
   7. Specification selection number
   8. Applicable standards, such as ASTM number or Federal specification
   9. Identification of deviations from contract documents
   10. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements, and compliance with contract documents

K. Failure to comply with the requirements of the Section may result in return of submittal without review.

3.03 RESUBMISSION REQUIREMENTS

A. Make corrections or changes in submittals required by Architect and resubmit when Architect's stamp requires resubmittal.

B. Shop Drawings and Product Data:
   1. Clearly identify all changes made, including those requested by Architect by "clouding" or other suitable means acceptable to Architect. Only changes that are "clouded" will be reviewed on a resubmittal. Architect is not responsible for reviewing resubmittals that are not "clouded" on resubmittal.

B. Samples: Submit new samples as required for initial submittal

C. Contractor is responsible for delays caused by resubmittal process.

3.04 DISTRIBUTION OF SUBMITTALS AFTER REVIEW

A. Distribute copies of shop drawings and project data which carry architect/engineer's stamp, or initialed approval, to:
   1. Contractor's file
   2. Job site file
   3. Record documents file
   4. Other prime contractors
   5. Subcontractors
   6. Supplier
   7. Fabricator

B. Distribute samples as directed.

3.05 ARCHITECT/ENGINEER'S DUTIES

A. Review submittals with reasonable promptness.

B. Review for:
   1. Design concept of project
   2. Information given in contract documents

C. Review of separate item does not constitute review of an assembly in which item functions.

D. Affix stamp, initials, or signature certifying to review of submittal.

E. Return submittals to contractor for distribution.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1—GENERAL

1.01 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances

C. References.

D. Testing and inspection services.

E. Examination.

F. Preparation.

1.02 REFERENCES

A. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction.

B. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

C. ASTM D 3740 - 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.

1.03 PRODUCT STANDARDS

A. For products or workmanship specified by association, trade, or other consensus 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 by date of issue current on date for receiving bids, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.

E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TESTING AND INSPECTION AGENCIES

A. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform specified testing.
   1. Prior to start of work, submit testing laboratory 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 Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

B. Testing agency selected must be approved by the owner/architect.

C. Inspection Agency: Comply with requirements of ASTM D3740, ASTM E329, and ASTM C 1077.

D. Laboratory: Authorized to operate in the State of Arkansas.

E. Laboratory Staff: Maintain a full time registered engineer on staff to review services.

F. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

G. Concrete Field Tests

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician Grade 1, according to ACI CP-1 or an equivalent certification program.

PART II—PRODUCTS

2.01 Not Used.

PART III—EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new 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. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 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.

3.03 QUALITY CONTROL AND 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. Perform Work 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, or disfigurement.

3.04 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.

3.05 MANUFACTURER'S 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 instruction when necessary.

B. Submit qualifications of observer to architect/engineer 30 days in advance of required observations.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

D. Refer to Section 01 3323, Shop Drawings. Project Data, and Samples, manufacturer's field reports article.

3.06 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:
   1. Test samples of mixes submitted by contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and contractor in performance of services.
   3. Perform specified sampling and testing of products in accordance with specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Architect and contractor of observed irregularities or non-conformance of Work or products.
   6. Perform additional tests and inspections required by Architect.
   7. Attend preconstruction meetings and progress meetings.

C. Agency Reports: After each test promptly submit two copies of report to Brackett Krennerich Architects and contractor. When requested by architect/engineer, provide interpretation of test results. Include the following:
   1. Date issued.
   2. Project title and number.
   3. Name of inspector.
   4. Date and time of sampling or inspection.
   5. Identification of product and specifications section.
   6. Location in the project.
   7. Type of inspection or test.
   8. Date of test.
   9. Results of test.
   10. Conformance with Contract Documents.

D. 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 the contractor.
   4. Agency has no authority to stop the Work.
   5. Agency has no authority to authorize additional work.

E. Contractor's Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used which 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 and laboratory 24 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 for contractor's use beyond specified requirements.
   6. Testing and employment of testing agency or laboratory shall not relieve the contractor of obligation to perform work in accordance with requirements of the Contract Documents.

F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

G. Re-testing required because of non-conformance to specified requirements shall be paid for by the contractor. Payment for re-testing or re-inspection will be charged to the contractor by deducting testing charges from the contract sum/price .

3.07 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4329
SPECIAL INSPECTIONS

PART 1-GENERAL

1.01 SECTION INCLUDES

A. Special Inspections as required by Chapter 17, "Structural Tests and Special Inspections" of the 2007 Edition Arkansas Fire Prevention Code Volume 2.
   1. See schedule of special inspection on the drawings.

B. Special Inspections required by individual specification sections.

1.02 RELATED SECTIONS

A. Section 01 4000 - Quality Requirements

B. Section 01 3323 - Submittals

C. Section 01 7800 - Close-Out Submittals

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals for submittal procedures.

B. Submit special inspection reports required by the contract documents.
   1. Certifications and special inspections required with product submittals.
   2. Special inspection reports of factory fabrications as required in specifications sections and Chapter 17 of the Arkansas Fire Protection Code.
   3. Special inspection reports for installed materials as required by specification sections and Chapter 17 of the Arkansas Fire Prevention Code are to be submitted with close-out documents.

1.04 TESTING AGENCIES

A. Testing agencies are to be independent agencies approved by the architect/owner in accordance with Section 01 4000 - Quality Requirements. Contractor to pay for testing services.

B. Special inspections scheduled on the drawings to be conducted by the architect, structural engineer, mechanical engineer, or electrical engineer will be conducted at no expense to the contractor.

PART 2-PRODUCTS

2.01 NOT USED.

PART 3-EXECUTION

3.01 INSPECTIONS

A. Submit name of testing agencies to the architect for approval prior to authorizing inspection services.

B. Testing agencies to submit report of tests and inspections to the contractor upon completion of each inspection. Contractor to promptly submit reports to the architect.

C. All special inspection reports are to be submitted with close-out documents; see Section 01 7800.

D. Notify the architect immediately if special inspections reveal non-conforming work.

END OF SECTION

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary heating
   3. Temporary ventilation
   4. Telephone service.
   5. Temporary water service.
   6. Temporary sanitary facilities.

1.02 TEMPORARY ELECTRICITY

A. Provided by Contractor.

1.03 TEMPORARY HEATING

A. Provided by Contractor.

1.04 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.05 TELEPHONE

A. Cellular phone at construction site will be permitted.

1.06 TEMPORARY WATER SERVICE

A. Provided by Contractor.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures.
   1. Building rest rooms are not to be used during construction.

B. Provide at time of project mobilization.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barriers to protect the Owner's staff.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE

A. Under regulation of the Department of Pollution Control and Ecology, the contractor shall be responsible for implementing pollution control methods for controlling storm water run-off from the construction site.

1.02 METHODOLOGY

A. Site of construction is in excess of 1 acre but less than 5 acres and is classified as a small construction site.

B. Arkansas Department of Environmental Quality (ADEQ) Requirements:
   1. Send "Notice of Intent" to ADEQ at least 48 hours prior to commencement of construction.
   2. Pay permit fee to ADEQ.
   3. Send copy of Storm Water Pollution Prevention Plan (SWPPP) to ADEQ for review before construction.
   4. Post Permit Certificate received from ADEQ at construction site.
   5. Use best management practices to reduce run-off.
   6. Inspect SW controls bi-monthly.

1.03 SWPPP PLAN

A. See the drawings and text included at the end of this section for the Storm Water Pollution Prevention Plan.

1.04 FORMS

A. "Notice of intent for discharges of storm water run-off associated with construction activity" is included at the end of this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch Cover: Straw from threshed rice, oats, wheat, barley or rye; of wood excelsior; or from hay obtained from various legumes or grasses, such as lespedeza, clover, vetch, soybeans, bermuda, carpet sedge, bahia, fescue or other legumes or grasses, or a combination thereof. Mulch shall be dry and reasonably free of Johnson grass or other noxious weeds, and shall not be excessively brittle or in an advanced state of decomposition. All materials will be inspected and approved prior to use.

B. Straw Bales: Straw for barrier bales shall consist of rice, oat, barley, wheat or rye straw or of available grasses free of an excessive amount of noxious weeds. Bales shall weigh approximately 35 lbs. Straw in an advanced state of decomposition will not be acceptable.

C. Filter Fabric: Typar 3401, Trevira S1115, or approved equal nonwoven polypropylene or polyester fabric.

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Submit permits as required.

B. Follow all ADEQ requirements.

C. Ensure that earthwork and final grading in area requiring erosion control have been brought to grade as required by contract documents.

D. Straw Bale Filter: Tightly bound straw bales embedded at least 4 inches into soil and each bale held in place by 2 stakes driven at least 18 inches into ground. Bales shall tightly abut adjacent bales. Strings shall not touch the ground.

E. Silt Fence: Fence post spaced no more than 10 feet apart and driven a minimum of 2 feet into ground. Post shall extend minimum of 2 feet above ground. Fasten metal mesh fence with 6 inch or smaller openings to fence posts to reinforce silt fence fabric. Mesh fence to extend 2 feet above grade and 4 inches into grade. Mesh may be omitted if reinforced silt fence fabric is used or in areas of low flow.

F. Nonvegetative Soil Stabilization: Utilize temporary nonvegetative soil stabilization to provide protection against excessive soil erosion over a short period of time. Required in areas that experience high water flows and high run-off velocities and at disturbed slopes steeper than 2:1.
   1. Mulch: Apply at 1.5 to 2.5 tons per acre.
   2. Anchor by peg and twine, mulch netting, erosion control, fabric, jute matting or mulch anchoring tool.

END OF SECTION

SECTION 01 5719
ENVIRONMENT PROTECTION

PART 1 GENERAL

1.01 DEFINITIONS

A. For the purpose of these specifications, environment protection is defined as the preservation of the environment in its preconstruction state to the greatest feasible extent throughout project construction.

1.02 QUALITY CONTROL

A. The Contractor shall inspect all environment protection operations for compliance with the contract requirements, perform all test as required, and maintain records of his quality control for all operations, including but not limited to the following: Compliance with all Federal, State and local pollution control regulations.
   1. Monitoring and surveillance procedures.
   2. Site access, parking, and traffic control of equipment.
   3. Locations of temporary facilities and support activities.
   4. Handling, storage, use, and disposal of petroleum products, chemicals, and toxic materials.
   5. Solid and liquid waste disposal.
   6. Noise control, dust control, and pest control.
   7. Disposal of construction materials and other debris.
   8. A copy of these records, including all tests performed and corrective actions taken, shall be furnished to the architect/owner.

1.03 NOTIFICATION

A. The Owner/Architect will notify the Contractor in writing of any non-compliance with any applicable Federal, State, or local laws or regulations. The Contractor shall, after receipt of such notice, immediately inform the Architect of proposed corrective action and take such action as may be approved. If the Contractor fails or refuses to comply promptly, the Owner/Architect may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time, or for excess costs or damages by the Contractor. The Architect shall be notified of any spillage of hazardous chemicals in excess of 2 gallons.

1.04 SUBCONTRACTORS

A. Compliance with the provisions of this section by subcontractors will be the responsibility of the Contractor.

1.05 PROTECTION OF LAND RESOURCES

A. The Contractor shall confine his construction activities to areas on the site as determined and outline at the Preconstruction Meeting.

1.06 PROTECTION OF WATER RESOURCES

A. General:
   1. The Contractor shall not pollute storm water with fuels, oil, bitumens, calcium chloride, acids, or other harmful materials. The Contractor shall investigate and comply with all applicable Federal, State, County and municipal laws concerning pollution of rivers and streams.

B. Spillages:
   1. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, and concrete drainage from entering storm water system.

C. Disposal:
   1. Disposal of any materials, wastes, effluents, trash, garbage, oil grease, chemicals, etc., in areas adjacent to streams shall not be permitted. Particular attention under this provision shall be given to lubricants and fuels drained from equipment and supply tanks.

1.07 DISPOSAL OF DEBRIS

A. All materials resulting from construction operations of such as undercut material, and debris shall be disposed of off-site by the Contractor as per Arkansas Department of Environmental Quality-Solid Waste Division regulatory requirements. The Contractor shall be responsible for compliance with all Federal, State, and local laws and regulations applicable to disposal of these materials. The contractor shall disclose the disposal site in the pre-construction conference. If private property is selected as disposal site, the property owner's written consent shall be furnished to the owner/architect.

B. Disposal of petroleum, oil, and lubricants (POL) products, chemicals, or other hazardous or toxic components, may require EPA approval or permits from the state. Where such permits are required, the Contractor shall be responsible for obtaining such permits and shall be responsible for the payment of any fines or penalties for failure to do so.

1.08 DUST CONTROL

A. The Contractor will be required to maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, plant sites, waste areas, borrow areas, and all other work areas within or without the project boundaries free from dust which would exceed allowable limits of the standards for air pollution.

1.09 NOISE CONTROL

A. The Contractor will be required to comply with Federal, State and local requirements for noise control of his vehicles and equipment.

1.10 EROSION CONTROL

A. The Contractor will be required to comply with Federal, State and local requirements for erosion control. The erosion control guidelines included with the project manual and erosion control measures as shown on the plans shall be followed throughout the construction.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

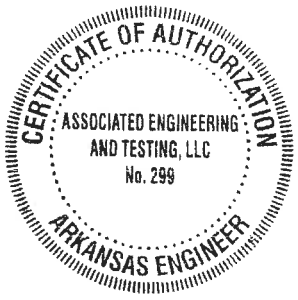
Stormwater Pollution Prevention Plan (SWPPP) for Construction Activity for Small Construction Sites

National Pollutant Discharge Elimination System (NPDES)
General Permit # ARR150000

Prepared for:
Poinsett County, Arkansas
Poinsett County Courthouse Addition
401 Market Street
Harrisburg, Arkansas

Date:
August 1, 2024

Prepared by:
Associated Engineering, LLC



Revised date: 02/17/2012

Project Name and Location: Poinsett County Courthouse Addition, 401 Market Street, Harrisburg, Arkansas

Property Parcel Number (*Optional*): N/A

Operator Name and Address: Poinsett County, Arkansas, 401 Market Street, Harrisburg, Arkansas 72432

A. Site Description
   a. Project description, intended use after NOI is filed: Public Development
   b. Sequence of major activities which disturb soils: Permits, Erosion control measures, grading, foundations, building, parking and drives, landscaping, cleanup.
   c. Total Area: 1.0 acres Disturbed Area: 1.0 acres

B. Responsible Parties

Individual/Company	Phone Number	Service Provided for SWPPP (i.e., Inspector, SWPPP revisions, Stabilization Activities, BMP Maintenance, etc.)
Not Selected At This Time		Provide SWPPP inspections and maintenance schedules. Responsibilities include installation, inspection, maintenance and repair/replacement of erosion control measures, revisions to the SWPPP.

C. Receiving Waters
   a. The following waterbody (or waterbodies) receives stormwater from this construction site: Runoff drains into an unnamed tributary of Hollow Slough, thence into Hollow Slough, thence into L'Anguille River, thence into St. Francis River.
   b. Is the project located within the jurisdiction of an MS4? ☒Yes ☐No
      i. If yes, Name of MS4: City of Harisburg, Arkansas

c. Ultimate Receiving Water:

☐ Red River	☐ White River
☐ Ouachita River	☒ St. Francis River
☐ Arkansas River	☐ Mississippi River

D. Site Map Requirements (Attach Site Map):
   a. Pre-construction topographic view;
   b. Direction of stormwater flow (i.e., use arrows to show which direction stormwater will flow) and approximate slopes anticipated after grading activities;
   c. Delineate on the site map areas of soil disturbance and areas that will not be disturbed under the coverage of this permit;
   d. Location of major structural and nonstructural controls identified in the plan;
   e. Location of main construction entrance and exit;
   f. Location where stabilization practices are expected to occur;
   g. Locations of off-site materials, waste, borrow area, or equipment storage area;
   h. Location of areas used for concrete wash-out;
   i. Location of all surface water bodies (including wetlands);
   j. Locations where stormwater is discharged to a surface water and/or municipal separate storm sewer system if applicable,
   k. Locations where stormwater is discharged off-site (should be continuously updated);
   l. Areas where final stabilization has been accomplished and no further construction phase permit requirements apply.

E. Stormwater Controls
   a. Initial Site Stabilization, Erosion and Sediment Controls, and Best Management Practices:
      i. Initial Site Stabilization: Silt fence will be installed around the perimeter of the site prior to construction activities commencing. As construction proceeds, additional measures, (silt fence, riprap, etc) will be placed.
      ii. Erosion and Sediment Controls: Silt fences will be installed around the limits of construction. Any measures that are being used incorrectly or inappropriately will be replaced or modified. Any sediment that leaves the site will be removed and placed back on site.
      iii. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the operator will replace or modify the control for site situations: ☒ Yes ☐ No

If No, explain: _____

_____

iv. Off-site accumulations of sediment will be removed at a frequency sufficient to minimize off-site impacts: ☒Yes ☐No

If No, explain: _____

_____

v. Sediment will be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%: ☒Yes ☐No

If No, explain: _____

_____

vi. Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges: ☒Yes ☐No

If No, explain: _____

_____

vii. Off-site material storage areas used solely by the permitted project are being covered by this SWPPP: ☐Yes ☒No

If Yes, explain additional BMPs implemented at off-site material storage area: _____

_____

b. Stabilization Practices

i. Description and Schedule: Existing vegetation will be preserved where attainable. As soon as rough grading is completed, the areas will receive temporary stabilization or mulch cover within 14 days of work stoppage. At the completion of the site work, the area will receive permanent stabilization and landscaping no later than 14 days after construction activities have ended.

ii. Are buffer areas required? ☒Yes ☐No

If Yes, are buffer areas being used? ☒Yes ☐No

If No, explain why not: _Site is not located along an existing creek, stream of ditch.

If Yes, describe natural buffer areas: Natural grass buffers used.

iii. A record of the dates when grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be included with the plan. ☒Yes ☐No

If No, explain: _____

_____

iv. Deadlines for stabilization: Stabilization procedures will be initiated 14 days after construction activity temporarily ceases on a portion of the site.

c. Structural Practices

i. Describe any structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site: Silt fences will be installed and maintained during the construction operations.

ii. Sediment Basins:

Are 10 or more acres draining to a common point? ☐Yes ☒No

Is a sediment basin included in the project? ☐Yes ☒No

If Yes, what is the designed capacity for the storage?

☐3600 cubic feet per acre = : _____

or

☐10 year, 24 hour storm = : _____

☐ Other criteria were used to design basin: _____

_____

If No, explain why no sedimentation basin was included and describe required natural buffer areas and other controls implemented instead: Less than 10 acres drain to a common point within the project area.

iii. Describe Velocity Dissipation Devices: None

F. Other Controls

a. Solid materials, including building materials, shall be prevented from being discharged to Waters of the State: ☒Yes ☐No

b. Off-site vehicle tracking of sediments and the generation of dust shall be minimized through the use of:

☒A stabilized construction entrance and exit

☐Vehicle tire washing

☐Other controls, describe: _____

_____

c. Temporary Sanitary Facilities: Temporary sanitary facilities will be provided by a licensed professional.

d. Concrete Waste Area Provided:

☒Yes

☐No. Concrete is used on the site, but no concrete washout is provided.

Explain why: _____

_____

☐ N/A, no concrete will be used with this project

e. Fuel Storage Areas, Hazardous Waste Storage, and Truck Wash Areas: No fuel or hazardous waste material will be stored on this site.

G. Non-Stormwater Discharges

a. The following allowable non-stormwater discharges comingled with stormwater are present or anticipated at the site:

☒ Fire-fighting activities;
☐ Fire hydrant flushings;
☐ Water used to wash vehicles (where detergents or other chemicals are not used) or control dust in accordance with Part II.A.4.H.2;
☐ Potable water sources including uncontaminated waterline flushings;
☐ Landscape Irrigation;
☐ Routine external building wash down which does not use detergents or other chemicals;
☐ Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled materials have been removed) and where detergents or other chemicals are not used;
☐ Uncontaminated air conditioning, compressor condensate (See Part I.B.12.C of the permit);,
☐ Uncontaminated springs, excavation dewatering and groundwater (See Part I.B.12.C of the permit);
☐ Foundation or footing drains where flows are not contaminated with process materials such as solvents (See Part I.B.12.C of the permit);

b. Describe any controls associated with non-stormwater discharges present at the site: _____

_____

H. Applicable State or Local Programs: The SWPPP will be updated as necessary to reflect any revisions to applicable federal, state, or local requirements that affect the stormwater controls implemented at the site. ☒ Yes ☐ No

I. Inspections

a. Inspection frequency:

☒ Every 7 calendar days

or

☐ At least once every 14 calendar days and within 24 hours of the end of a storm even 0.5 inches or greater (a rain gauge must be maintained on-site)

b. Inspections:

Completed inspection forms will be kept with the SWPPP.

☒ ADEQ's inspection form will be used (See Appendix B)

or

☐ A form other than ADEQ's inspection form will be used and is attached (See inspection form requirements Part II.A.4.L.2)

c. Inspection records will be retained as part of the SWPPP for at least 3 years from the date of termination.

d. It is understood that the following sections describe waivers of site inspection requirements. All applicable documentation requirements will be followed in accordance with the referenced sections.

   i. Winter Conditions (Part II.A.4.L.3)

   ii. Adverse Weather Conditions (Part II.A.4.L.4)

J. Maintenance:

The following procedures to maintain vegetation, erosion and sediment control measures and other protective measures in good, effective operating condition will be followed: Maintenance of vegetation will be under the direction of the owner. Any necessary repairs will be completed, when practicable, before the next storm event, but not to exceed a period of 3 business days of discovery, or as otherwise directed by state or local officials.

K. Employee Training:

The following is a description of the training plan for personnel (including contractors and subcontractors) on this project: Before the contractor and/or their inspectors begin work, a meeting will be scheduled with the Poinsett County Officials dealing with erosion control and sediment management practices. **Note, Formal training classes given by Universities or other third-party organizations are not required, but recommended for qualified trainers; the permittee is responsible for the content of the training being adequate for personnel to implement the requirements of the permit.

Certification

"I certify under penalty of law that this document and all attachments such as Inspection Form were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Responsible or Cognizant Official: _____

Title: _____ Date: _____

ARR150000 Inspection Form

Appendix A

Inspector Name: _____ Date of Inspection: _____

Inspector Title: _____

Date of Rainfall: _____ Duration of Rainfall: _____

Days Since Last Rain Event: _____ days Rainfall Since Last Rain Event: _____ inches

Description of any Discharges During Inspection: _____

Location of Discharges of Sediment/Other Pollutant (specify pollutant & location): _____

_____

Locations in Need of Additional BMPs: _____

Information on Location of Construction Activities

Location	Activity Begin Date	Activity Occuring Now (y/n)?	Activity Ceased Date	Stabilization Initiated Date	Stabilization Complete Date

Information on BMPs in Need of Maintenance

Location	In Working Order?	Maintenance Scheduled Date	Maintenance Completed Date	Maintenance to be Performed By

Changes required to the SWPPP: _____ Reasons for changes: _____

_____ _____

_____ _____

SWPPP changes completed (date): _____

"I certify under penalty of law that this document and all attachments such as Inspection Form were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Responsible or Cognizant Official: _____ Date: _____

Title: _____

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

1.02 RELATED SECTIONS

A. Section 00 2100, Instructions to Bidders - Standards of Quality.

B. Section 01 6300 – Product Options and Substitutions

1.03 PRODUCTS

A. Provide products of qualified manufacturers suitable for intended use. Provide products of each type by a single manufacturer unless specified otherwise.

1.04 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.05 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection. When products are stored off-site, they must be inventoried by Architect before payment can be made. Insurance certificates must name the owner as certificate holder/beneficiary.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.06 PRODUCT OPTIONS

A. See Section 01 6300 – Product Options and Substitutions

1.07 PRODUCT SUBSTITUTION PROCEDURES

A. See Section 01 6300 – Product Options and Substitutions

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 6300
PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Special definitions

B. Methods of specifying

C. Substitution procedures

1.02 RELATED SECTIONS

A. Section 00 2100, Instructions to Bidders – Substitution Approval

B. Section 0 6000, Project Forms – Substitution Request Form

1.03 DEFINITIONS

A. **Standard of Quality:** Specified manufacturers, materials, products, and equipment have been used in preparing the Contract Documents and thus establish minimum qualities for performance and appropriateness.

1. Materials, products, and equipment, described in the Contract Documents establish a standard of required function, dimension, appearance, and quality.
2. Comply with specifications and reference standards as minimum requirements.
3. Where a particular manufacturer and product is indicated, followed by a description of the product (material and equipment) including special features or performance criteria, the manufacturer shall agree to make necessary modifications to their "Standard or Custom Products" to fully comply with the product described.

B. **Material Base Bid:** as specified.

C. **Material Equivalency:** to be determined as stated below.

D. Under the "Or Equal" clause, other manufacturers, and products which are equal in size, design, function, and performance are acceptable for substitution into the project only when the following requirements are complied with:

1. Requests to use "Or Equal" products must be made to the Architect by indicating requested "Or Equals" on the Subcontractor/Material List. Subcontractor/Material List and all requests for "Or Equals" must be received by the Architect within 7 days prior to receipt of bids. Requests received after said date may be considered or rejected at the discretion of the Architect.
2. Decisions of the Architect concerning review of "Or Equal" products are final.

E. **Substitutions:** Requests for changes in products (materials and equipment) and methods of construction required by the Contract Documents are requests for "substitutions".

1. The following are not defined as substitutions as used herein:
   a. Scope revisions to Contract Documents requested by Owner and Architect.
   b. Specified product options or alternate construction methods included in Contract Documents.
   c. Contractor's determination of and compliance with governing regulations and orders issued by authorities having jurisdiction.

1.04 METHODS OF SPECIFYING

A. **Reference Standard Specifications:** Where products (material and equipment) are specified only by reference standard, provide products complying with standard.

1. If reference standard is followed by a description of a product's special features, or performance criteria: Modify "Standard or Custom Products" to fully comply with the description of the specified product's special features or performance criteria.

B. **Descriptive Specifications:** Where products (material and equipment) are specified by indicating a detailed description of the required properties, minimum attributes, special features, or performance criteria required, provide products complying with the specified description.
   1. If a description of the required properties, minimum attributes, special features, or performance criteria required, provide products complying with the specified description.
      a. If a manufacturer's standard product is listed in the specification and does not comply with the minimum description indicated, make modifications to the "Standard or Custom Product" to make the product fully comply with the description of the specified product's special features, or performance criteria.
   2. If a list of specified manufacturers includes the following statement "Comparable products of other specified manufacturers", then select product from only manufacturers listed in the Project Manual or addenda complying with the minimum attributes, special features, or performance criteria.
   3. If list of specified manufacturers includes the following statement, "Comparable products of other manufacturers", then select a product from any manufacturer that complies with the minimum attributes, special features, and performance criteria.

C. The design layout, space allocations, connection details, performance criteria, etc., are based on specifically identified proprietary products identified in Part 2 – Products of each specification section.
   1. Other manufacturers, even if listed as "Acceptable Manufacturers", shall comply with the minimum levels of material, detailing, and dimensional restrictions established by the proprietary product.

1.05 SUBSTITUTION TIME FRAME AND CONSIDERATIONS

A. Pre-Bid Substitutions (Prior Approval):
   1. Submittal Time Limit: Not less than 7 days before Bid opening
   2. Consideration: Substitution will only be considered if each request includes the information listed under "Consideration Requirements" Article specified below.

B. Failure to complete "Substitution Request Form" or submit requested information is grounds for rejection.

C. Post-Bid/Pre-Award Substations; Bid Adjustment Substitutions:
   1. Substitution Time Limit: Before Award of Contract date.
   2. Consideration: Substitution will be considered if submitted by the pending Contractor and substitution request is being made because a specified product has become unavailable or potential savings to Owner.
      a. Request shall include information listed under "Consideration Requirements" Article specified below.

1.06 SUPPORTING INFORMATION FOR SUBSTITUTIONS

A. Include the following supporting information: Name of product (material or equipment) for which substitution is being requested and a complete description of the proposed substitute including drawings, product, performance and test data, and any other information necessary for an evaluation.
   1. Substitution Request Form: Completed Substitution Form must accompany each request for substitution.
      a. Include a statement indicating changes in other materials, equipment, or other Work that incorporation of this substitute would require.
      b. Alterations or changes to other Work are the responsibility of the Contractor proposing substitution, including redesign if determined by Architect.
   2. Burden of proof of the merit of the proposed substitute is upon the proposer.

B. It is understood and agreed by bidders, Contractors, material suppliers, and tier subcontractors, that bids and contracts shall be based on products (materials and equipment) and processes as specified or as revised by addenda or modifications.

1.07 CONSIDERATION REQUIREMENTS

A. **Substitution request will be considered by Architect when requested for review by the Owner / CM and the following conditions are satisfied:**
   1. Extensive revisions to Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of Contract Documents.
   3. Substitution Request form is completed and attached. Additionally, 1 or more of the following are satisfied.
      a. If a specified product is not available.
      b. Specified product or method of construction cannot be provided within Contract Time. Request will not be considered if product or method cannot be provided is a result of failure to peruse the Work promptly or coordinate activities properly.
      c. Specified product or method of construction cannot receive necessary approval by a governing authority, and requested substitution can be approved.
      d. Substantial advantage is offered to Owner, in terms of cost, time energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear, including additional compensation to Architect for redesign and evaluation services, increased cost of other construction or separate contractors, and similar considerations.
      e. Specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where Contractor certifies substitution will overcome incompatibility.
      f. Specified product or method of construction cannot be coordinated with other materials, and Contractor certifies proposed substitution can be coordinated.
      g. Specified product or method of construction cannot provide warranty required by the Contract Documents and Contractor certifies proposed substitution provides required warranty.

B. Where proposed substitution involves more than 1 installer, installers shall cooperate to coordinate the Work, provide uniformity and consistency, and to ensure compatibility of products.

C. Submit a separate substitution request for each product, supported with complete Product Data, Drawings, and Samples including but not limited to the following:
   1. Comparison of qualities of proposed substitution with specified product.
   2. Changes required in other elements of the Work because of the substitution.
   3. Effect on construction schedule.
   4. Cost data comparing proposed substitution with specified product.
   5. License, fees, or royalties required.
   6. Availability of maintenance service, and source of replacement materials.

D. To determine if proposed substitution complies with the function, appearance, quality, performance, and dimensional characteristics of specified item, Architect may:
   1 Require Sample unit, technical Product Data, and independent test reports sufficient to establish compliance.
      a. Cost of which shall be paid by the submitting party.

1.08 CONTRACTOR'S / BIDDER'S REPRESENTATION

A. A request for substitution constitutes a representation that Contractor / Bidder:

1. Has investigated proposed product and determined that it is equal to or superior in all respects to specified product.
2. Will provide the same or better warranties or bonds for substitution as for the specified product.
3. Will coordinate installation of substitution, if accepted, into the Work; and make other changes as required to make the Work complete
4. Waives claims for additional cost, under his responsibility, which may subsequently become apparent.

1.09 ARCHITECT'S EVALUATION PROCESS

A. Architect is sole judge of acceptability of proposed substitution.

B. Architect will review requests for substitutions with reasonable promptness, and respond as follows:
   1. Request additional information or documentation necessary for evaluation.
   2. Pre Award: Notify Bidders of the decision to accept proposed substitution by written addendum.
   3. Post Award: Notify Contractor in writing of the decision to accept or reject proposed substitution.

C. Accepted substitutions will be documented by Architect's supplemental instruction (ASI or Construction Change Directive (CCD), depending on whether it is necessary to adjust contract amount, including manufacturers' names and catalog numbers.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 7300
EXECUTION REQUIREMENTS

PART 1—GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Demonstration and Instructions

C. Protecting installed construction.

1.02 RELATED SECTIONS

A. Section 01 7329, Cutting and Patching

B. Section 01 7400, Cleaning

C. Section 01 7800, Close-out Submittals

D. Section 01 7839, Project Record Documents

1.03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.

B. Provide submittals to Architect that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.04 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two (2) weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season.

C. Utilize Operation and Maintenance Manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at the site.

1.05 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

1.06 USE OF BUILDING

A. Contractor shall allow the owner use of the substantially completed building for placement and installation of equipment. Such use of the structure shall not signify that the owner accepts the building.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 01 7329
CUTTING AND PATCHING

PART 1 GENERAL

1.01 SCOPE

A. Execute cutting (including excavating), fitting, or patching of work required to:
   1. Make several parts fit properly.
   2. Uncover work to provide for installation of ill-timed work.
   3. Remove and replace defective work.
   4. Remove and replace work not conforming to the requirements of contract documents.
   5. Remove samples of installed work as specified for testing.

B. Do not endanger any work by cutting or altering work or any part of it.

C. Do not cut or alter work of another contractor without written consent of architect/engineer.

1.02 SUBMITTALS

A. Prior to cutting which affects structural safety of project, or work of another contractor, submit written notice to architect/engineer, requesting consent to proceed with cutting, including:
   1. Identification of project
   2. Description of affected work
   3. Necessity for cutting
   4. Affect on other work, on structural integrity of project
   5. Description of proposed work. Designate:
      a. Scope of cutting and patching
      b. Contractor and trades to execute work
      c. Products proposed to be used
      d. Extent of refinishing
   6. Alternatives to cutting and patching
   7. Designation of party responsible for costs of cutting and patching

B. Prior to cutting and patching done on instruction of architect/engineer, submit cost estimate.

C. Should conditions of work, or schedule, indicate a change of materials or methods, submit written recommendation to architect/engineer, including:
   1. Conditions indicating change
   2. Recommendations for alternative materials or methods
   3. Submittals as required for substitutions

1.03 PAYMENT OF COSTS

A. Costs caused by ill-timed or defective work, or work not conforming to contract documents, including costs for additional services of architect/ engineer: party responsible for ill-timed, rejected, or non-conforming work.

B. Work done on instructions of architect/engineer, other than defective or non-conforming work: owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials for replacement of work removed shall comply with specifications for type of work to be done.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of work, including elements subject to movement or damage during:
   1. Cutting and patching
   2. Excavating and backfilling

B. After uncovering work, inspect conditions affecting the installation of new products.

3.02 PREPARATION (PRIOR TO CUTTING)

A. Provide shoring, bracing, and support as required to maintain structural integrity of project.

B. Provide protection for other portions of project.

3.03 PERFORMANCE

A. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerance, finishes.

B. Execute excavating and backfilling by methods which will prevent damage to other work and will prevent settlement.

C. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of contract documents.

D. Refinish entire surfaces as necessary to provide an even finish.
   1. Continuous surfaces: to nearest intersections
   2. Assembly: entire refinishing

END OF SECTION

SECTION 01 7400
CLEANING

PART 1 GENERAL

1.01 SCOPE

A. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.

1.02 RELATED SECTIONS

A. Section 01 5719, Environment Protection

B. Section 01 7300, Execution Requirements

1.03 SAFETY REQUIREMENTS

A. Standards: Maintain project in accord with governing safety and insurance standards.

B. Hazard Control:
   1. Store volatile wastes in covered metal containers, and remove from premises daily.
   2. Prevent accumulation of wastes which create hazardous conditions.
   3. Provide adequate ventilation during use of noxious substances.

C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of volatile wastes such as mineral spirit, oil, or paint thinner in storm or sanitary drains.
   3. Do not dispose of wastes into lakes, streams, or waterways.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning materials manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Execute cleaning to ensure that grounds, and public properties are maintained free from accumulations of waste materials and rubbish.

B. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from site and legally dispose of at public or private dumping areas off owner's property.

3.02 FINAL CLEANING

A. Employ experienced workmen or professional cleaners for final cleaning.

B. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.

C. Broom clean paved surfaces; rake clean other surfaces of grounds.

D. Maintain cleaning until project, or portion thereof, is occupied by owner.

END OF SECTION

SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Required documents for final payment.

1.02 RELATED SECTIONS

A. Section 01 7800, Closeout Submittals

B. Section 00 6000, Project Forms

C. Section 01 7839, Project Record Documents

1.03 REQUIRED DOCUMENTS FOR FINAL PAYMENT

A. Contractor to notify the architect in writing that all punch list items are complete and the project is ready for acceptance by the owner.

B. "Substantial Completion" will be issued by the architect, at which time the contractor shall submit the "Final Pay Request".

1.04 DOCUMENTS TO BE SUBMITTED WITH FINAL PAY REQUEST

A. Consent of Surety to Final Payment.

B. Affidavit of Payment of Debts and Claims.

C. Affidavit of Release of Liens.

D. Required Operation and Maintenance Data.

E. Required Warranties.

F. Project Record Documents

G. Special Inspections Reports

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 NOT USED

END OF SECTION

SECTION 01 7800
CLOSE-OUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Operation and Maintenance Data

B. Manual for Materials and Finishes

C. Manual for Equipment and Systems

D. Product Warranties and Product Bonds

1.02 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch pages, two D size ring binders with durable plastic covers.

B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

E. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, Listing names, addresses, and telephone numbers of architect/Engineer, Contractor, Subcontractors, and major equipment. suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instruction for equipment and systems.
      f. Maintenance instruction for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Photocopies of warranties and bonds.
   4. Submit two sets of final volumes and two DVD's, CD's, or Flash Drive within 10 days after final inspection.
   5. Final pay requites will not be processed until all close-out documents are received.

1.03 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of manual within 10 days after final inspection. Manual to be as described in 1.02, A-E above.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations.

D. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

E. 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.

F. Additional Requirements: As specified in individual product specification sections.

G. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

H. Final pay request will not be processed until all close-out documents are received.

1.04 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of manual within 10 days after final inspection. Manual to be as described in 1.02, A-E above.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

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.

Q. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

R. Final pay request will not be processed until all close-out documents are received.

1.05 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify that documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time Of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten 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 ten days after acceptance, listing the date of acceptance as the beginning of the warranty or bond period.

1.06 NUMBER OF MANUALS

A. Manuals required in 1.02, 1.03, 1.04 and 1.05 may be combined into one or two manuals if volume of data will permit use of D size ring binders.

PART 2 PRODUCTS

3.01 NOT USED

PART 3 EXECUTION

4.01 NOT USED

END OF SECTION

SECTION 01 7839
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 DOCUMENTS:

A. Maintain at the job site, one copy of:
   1. Contract drawings
   2. Specifications
   3. Addenda
   4. Reviewed shop drawings
   5. Change Orders
   6. Other modifications to contract
   7. Field test records

B. Maintain one set of documents in clean, dry, legible condition; documents not to be used for construction purposes.

C. Record all changes made during construction with red pencil.

1.02 RECORDING

A. Label each document "Project Record" in 2" high printed letters.

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

D. Contract Drawings: Legibly mark up to record actual construction:
   1. Horizontal and vertical location of underground utilities and appurtenances referred to permanent surface improvements.
   2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
   3. Field changes of dimension and detail.
   4. Changes made by change order or field order.
   5. Details not on original contract drawings.

E. Specifications and Addenda: Legibly mark up each section to record:
   1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
   2. Changes made by change order or field order.
   3. Other matters not originally specified.

F. Shop Drawings: Maintain as record documents; legibly annotate following drawings to record changes made after review:
   1. Plumbing
   2. Mechanical

1.03 SUBMITTAL

A. At completion of project, deliver documents to architect.
   1. One hard copy and one digital copy on DVD, CD, or Flash Drive.

B. Record documents to be submitted with Final Pay Request.

C. Final payment will be not be made until all closeout documents are received by the Architect.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

DIVISION 02

EXISTING CONDITIONS

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of all utilities and piping below slabs to be removed.

B. Removal of existing sidewalks, existing curbs, paving, and other site appurtenances required for construction of new work.

C. Abandonment and removal of existing utilities as shown on drawings and required for construction of new work.

1.02 RELATED REQUIREMENTS

A. Section 00 2100 – Pre-Bid Conference

B. Section 01 5000 - Temporary Facilities and Controls: Protective Barriers

C. Section 01 5719 - Environment Protection: Disposal of Debris

1.03 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; 2004.

1.04 PROJECT CONDITIONS

A. 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.

B. Protection: Protect existing objects designated to remain. In event of damage, immediately make repairs and replacements necessary to approval of architect at contractor's expense.

1.05 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required with a minimum of 3 years of documented experience.

A. Supervision: One person representing the demolition contration must be present during demolition operations. Designated person must be familiar with type of demolition required.

B. Codes and Standards: Comply with pertinent codes and regulations, plus requirements of insurance carriers providing coverage for work.

1.06 DISPOSAL OF DEBRIS

A. All material resulting from demolition operations of material, and debris shall be disposed of off-site by the Contractor as per Arkansas Department of Environmental Quality-Solid Waste Division regulatory requirements. The Contractor shall be responsible for compliance with all Federal, State, and local laws and regulations applicable to disposal of these materials. All materials must be disposed of in a Class 4 land fill.

B. Disposal of petroleum, oil, and lubricants, (POL) products, chemicals, or other hazardous or toxic components, may require EPA approval or permits from the state. Where such permits are required, the Contractor shall be responsible for obtaining such permits and shall be responsible for the payment of any fines or penalties for failure to do so.

1.07 PREPARATION

A. Contractor is to visit the site and carefully inspect building to be removed. See Section 00 2100, Instruction to Bidders, for Pre-bid meeting.

B. By submitting his bid, the bidder acknowledges that he/she has inspected the site and is familiar with all conditions and requirements for demolition work to be completed under this contract.

C. Identify all active utilities to remain and determine requirements for their protection.
   1. The contractor will have all utilities disconnected and capped or terminated before work under this contract will begin.

D. Locate all adjacent utilities. Contractor is to call Arkansas One Call, 811 prior to beginning operations.

E. Contractor is responsible for safety of all operations required under this contract.
   1. Follow all OSHA standards for demolition work.

F. Damage to adjacent buildings, property, utilities created by demolition operations is the sole responsibility of the contractor. Repair will be at contractor's expense.

G. Clarification:
   1. Drawings do not purport to show all objects existing on site.
   2. Before commencing work of this section, verify with architect all objects to be removed and all objects to be preserved.

H. Scheduling:
   1. Schedule work in a careful manner with necessary consideration for inhabitants of existing buildings.
   2. Avoid interference with use of, and passage to and from, adjacent buildings and facilities.

I. Disconnection of Utilities:
   1. Prior to "Notice to Proceed" the construction manager will disconnect and cap all existing utilities to the buildings to be removed.
   2. Contractor is to verify that disconnects are suitable to accommodate demolition operations.

J. Preserve in operating condition active utilities bordering or traversing site that are to remain. Protect property, including but not limited to, valve boxes, poles, guys, and related appurtenances. Repair damage to active utility, due to work under contract, to satisfaction of utility concerned.

K. Before starting demolition and removal work, furnish and erect necessary barricades. Consult with owner to arrange to perform work on schedule that will permit owner to continue activities in adjacent buildings with minimum of inconvenience or interruption and to maintain security of premises at all times. Barricades shall provide for safe passage at all times.

1.08 SALVAGE RIGHTS

A. All materials to be demolished and removed under this contract are the property of the demolition contractor. Salvage rights to all materials belong to the demolition contractor.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove from the site all materials as shown on the drawings to be removed. All materials shown to be removed are to be removed from the site and disposed of by the contractor.
   1. All existing materials that must be removed for installation of new work required under this contract.

B. Contractor shall demolish all site appurtenances not specifically called out, if necessary for the installation of the new structures.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. The general contractor shall familiarize himself/herself with the site and be aware of all site appurtenances and portions of the existing building to be removed, and by submitting a bid assumes responsibility for all demolition work to be performed.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

C. Care is to be taken not to damage existing materials to remain. Any damage to existing materials is to be the responsibility of the general contractor.

D. Preparation:
   1. Prior to work of this section, carefully inspect entire site and objects designated to be removed and preserved.
   2. Locate existing utility lines to be abandoned and determine requirements for disconnecting and capping.
   3. Locate existing active utility lines which are to remain and determine requirements for their protection.

E. Clarification:
   1. Drawings do not purport to show all objects existing on site.
   2. Before commencing work of this section, verify with architect all objects to be removed and all objects to be preserved.

F. Scheduling:
   1. Schedule work in a careful manner with necessary consideration for inhabitants of existing buildings.
   2. Avoid interference with use of, and passage to and from, adjacent buildings and facilities.

3.03 EXISTING UTILITIES

A. Protect existing utilities to remain from damage.

B. Do not disrupt public utilities without permit from authority having jurisdiction.

C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to the owner.

D. Before commencing demolition or removal, and if not already accomplished, disconnect or arrange for disconnection of utility service connections, including water, gas, electricity, and telephone, to portions of building to be demolished complying with regulations of utility concerned.

E. Preserve in operating condition active utilities to adjacent building structures. Repair damage to active utility, due to work under contract, to satisfaction of utility concerned.

F. Before starting demolition and removal work, furnish and erect necessary barricades. consult with owner and arrange to perform work on schedule that will permit owner to continue activities in adjacent campus buildings with minimum of inconvenience or interruption and to maintain security of premises at all times. Barricades shall provide for safe passage at all times.

3.04 TEMPORARY SUPPORTS

A. During process of demolition and removal, install temporary supports and bracing to prevent building damage.

3.05 WORKMANSHIP

A. Completely remove all structure as indicated on the drawings. Structures and all interior building materials and components are to be removed including slabs, footing, and underground utilities.

A. All existing concrete paving, walks, etc. as shown on the demolition drawings and as required for completion of work under this contract. All items are to be removed from the site.

B. Any demolition work that will require interruption of existing utility service must be coordinated with the owner.

C. Care is to be taken not to damage existing materials to remain. Any damage to existing materials is to be the responsibility of the Contractor.

D. All materials from demolished structures are the property of the contractor.

3.06 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Dispose of all materials in legal dumping areas and comply with all local ordinances and Federal anti-pollution laws.

C. Leave site in clean condition, ready for subsequent work.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Extruded Polystyrene Board Insulation formwork.

C. Elevated concrete slabs.

D. Floors and slabs on grade.

E. Concrete foundation walls.

F. Drilled concrete piers.

G. Concrete reinforcement.

H. Joint devices associated with concrete work.

I. Miscellaneous concrete elements, including equipment pads, light pole bases, drainage structures.

J. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements, for testing.

B. Section 07 2113 – Board Insulation for formwork.

C. Section 07 2600 - Vapor Retarder for under slabs on grade.

D. Section 07 9005 - Joint Sealers.

E. Section 31 2323 - Drainage fill under slabs-on-grade.

F. Section 32 1313 – Concrete Paving: Sidewalks, curbs, and gutters.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2005.

C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).

D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

F. ACI 306R - Cold Weather Concreting; American Concrete Institute International. 2002.

G. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).

H. ACI 315 - Details and Detailing of Concrete Reinforcing.

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2008.

J. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; 2004.

K. ASTM A 185/A 185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

L. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2009b.

M. ASTM C 33 - Standard Specification for Concrete Aggregates; 2008.

N. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2009a.

O. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2009a.

P. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2009.

Q. ASTM C 150 - Standard Specification for Portland Cement; 2007.

R. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

S. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2009.

T. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2006.

U. ASTM C 330 - Standard Specification for Lightweight Aggregates for Structural Concrete; 2005.

V. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2008a.

W. ASTM C 881/C 881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2002.

X. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999 (Reapproved 2008).

Y. ASTM C 1107/C 1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2008.

Z. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2008).

AA. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

AB. ASTM E 1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers Metric; 1996 (Reapproved 2008).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

C. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mix water to be withheld for later addition at Project site.

D. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

E. Welding Certificates: Copies of certificates for welding procedures and personnel.

F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Cementitious materials and aggregates.
   2. Form materials and form-release agents.
   3. Steel reinforcement and reinforcement accessories.
   4. Admixtures.
   5. Curing materials.
   6. Floor and slab treatments.
   7. Bonding agents.

8. Adhesives.
9. Vapor retarders.
10. Epoxy joint filler.
11. Joint-filler strips.
12. Repair materials.
13. Waterstops.
14. Extruded Polystyrene Board Insulation framework.

G. Provide ACI certification documentation for all finishers who will be installing concrete prior to starting any concrete operations.

H. Minutes of preinstallation conference.

I. Reproduction of contract drawings, in any form, will not be accepted as shop drawings.

J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Acquire cement from same source and aggregate from same source for entire project.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

E. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
   1. Concrete flatwork shall be performed utilizing high quality techniques conforming to American Concrete Institute Standards provided for by ACI Publications CP-10, Concrete Flatwork Technician and Flatwork Finisher, ACI Publication CCS-1, Concrete Craftsman Series, Slabs on Grade.
   2. All concrete installation shall be performed by at least one ACI Flatwork Finisher or Technician currently certified with ACI.
   3. All projects greater than 10,000 square feet will require at least two ACI Flatwork Finishers or Technicians currently certified with ACI.

F. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

G. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. See Section 01 4000 for additional requirements.

H. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

I. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code-Reinforcing Steel."

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1, Section 01 3119 “Project Meetings".
   1. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixes.
c. Ready-mix concrete producer.
d. Concrete subcontractor.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI 347 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. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

C. **See Section 07 2113 – Board Insulation; concrete formwork; RE: structural drawings.**

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished.

B. Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain type.
   1. Mesh Size: 6x6.
   2. Wire Gage: As shown on the drawings.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal, Type 1A - Air Entraining; Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.
   1. Fine Aggregate: Clean, sharp, natural or manufactured sand, free from loam, clay, lumps, or other deleterious substances.
   2. Coarse Aggregate: Clean, uncoated, processed, locally available aggregate, containing no clay, mud, loam or foreign matter; maximum size of 1-1/2" at foundations and 1" at slabs.

C. Fly Ash: ASTM C 618, Class C.

D. Water: Clean and not detrimental to concrete.

2.04 CHEMICAL ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260.

B. Other Admixtures: Do not use other admixtures unless approved by architect; added chlorides will not be accepted.

2.05 ACCESSORY MATERIALS

A. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.
   1. Polyvinyl Acetate (Interior Only):
      a. Euclid "Euco Weld"
      b. L & M "Everweld"
      c. Or approved equal.
   2. Acrylic or Styrene Butadiene:
      a. Euclid "SBR Latex"
      b. L & M "Everbond"
      c. Conspec "Strongbond"

d. Master Builders "Acryl-Set"
e. Sonneborn "Sonocrete"
f. Or approved equal

B. Epoxy Bonding System: ASTM C 881, type as required by project conditions.
1. Conspec "Spec-Bond 100"
2. Euclid "Euco Epoxy System #452 or "Dural Fast Set Epoxy System."
3. L & M "Epabond"
4. Master Builders "Concresive Standard Liquid"
5. Or approved equal

C. Underslab Vapor Retarder: See Section 07 2600.

D. Non-Shrink Grout: ASTM C 1107/C 1107M; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Minimum Compressive Strength at 48 Hours: 2,400 psi.
2. Minimum Compressive Strength at 28 Days: 7,000 psi.
3. Products:
a. Conspec "100 Non-Shrink Grout (non-metallic)"
b. Euclid "NS Grout."
c. L & M "Crystex"
d. Master Builders "Masterflow 713"
e. W.R. Meadows "Sealtight Cg-86 Grout"
f. Or approved equal

E. Moisture-Retaining Cover: ASTM C 171; clear polyethylene or white burlap-polyethylene sheet.

F. Curing Compound: ASTM C309, Type I, Class A
1. Moisture loss not more than 0.055 gr/ sq. cm when applied at 200 sq. ft. /gal.
2. Conspec "Cure & Seal"
3. L & M "L & M Dress and Seal".
4. W. R. Meadows "Sealtight CS-309"
5. Master Builders "MasterKure"
6. Sonneborn "Kure-N-Seal"

G. Concrete Sealer:
1. Scofield Selectseal-Plus
2. Or approved equal

2.06 BONDING AND JOINTING PRODUCTS

A. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or cork, complying with ASTM D 1751, 1/2 inch thick and full depth of slab less 1/2 inch.

B. Construction Joint Forms: To be used on all construction joints in slabs on grade.
1. Screed Key, Meadow Burke Concrete Accessories, Inc., Denver, Colorado.
2. Use 3-1/2 inch form for 4 inch thick slab.

C. Expansion Joint Devices: Integral extruded plastic; 1/2 inch thick, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

D. Sealant and Primer: As specified in Section 07 9005.

2.07 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 trial mixtures, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: As scheduled.
2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
3. Cement Content:
   a. 3000 psi mix: 470 lbs/yd^3 without air
   b. 4000 psi mix: 564 lbs/yd^3 without air
   c. 4000 psi mix: 611 lbs/yd^3 with air
4. Water-Cement Ratio:
   1) 3000 psi mix: 0.53 without air
   2) 4000 psi mix: 0.44 without air
   3) 4000 psi mix: 0.40 with air
   e. Total Air Content: 4 percent, determined in accordance with ASTM C 173/C 173M.
   f. Maximum Slump: As scheduled.

2.08 MIXING

A. Transit Mixers: Comply with ASTM C 94/C 94M.
   1. Furnish batch ticket information.
   2. When air temperature is between 85 and 90 degrees F. reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F., reduce mixing and delivery time to 60 minutes.

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. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. 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.

E. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

F. Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by taping edges and ends.

3.03 INSTALLING REINFORCEMENT

A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Notify Brackett Krennerich Architects not less than 24 hours prior to commencement of placement operations.

D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Repair underslab vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight.

F. Separate slabs on grade from vertical surfaces with joint filler.

G. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

H. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07 9005 for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

K. Apply sealants in joint devices in accordance with Section 07 9005.

L. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

M. Place concrete continuously between predetermined expansion, control, and construction joints.

N. Do not interrupt successive placement; do not permit cold joints to occur.

O. Place floor slabs in checkerboard pattern indicated.

P. Saw cut joints within 12 hours after placing. Use 1/8 inch thick blade, cut into 1/4 depth of slab thickness. Do not allow slab to cure over night before cutting joints. Slab joints must be cut same day slab is placed.

Q. Screed floors level, maintaining the following minimum F(F) Floor Flatness and F(L) Floor Levelness values when measured in accordance with ASTM E 1155/ASTM E 1155M.
   1. All Floors:
      a. F(F): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 24.
      b. F(L): Specified Overall Value (SOV) of 25; Minimum Localized Value (MLV) of 17.

3.05 CONCRETE FINISHING

A. Repair surface defects, immediately after removing formwork.
   1. Small area honeycombing less than 1 inch deep may be repaired as described below for exposed form finishes.
   2. Honeycombing in large areas or honeycombing 1 inch deep or greater may not be repaired. Notify the architect immediately after removal of form work. Architect will determine if concrete is to be removed or the method of repair if repair is allowed by architect.

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.
   2. Grout mixtures will not be allowed.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 301.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: "Steel trowel" as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
      a. Prior to occupancy of building, apply one additional coat of sealer/curing compound.

3.06 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. 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 or saturated burlap.
   2. Final Curing: Begin after initial curing but before surface is dry.
      a. Moisture-Retaining Cover: Seal in place with waterproof tape or adhesive.
      b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.
      c. Slabs to be left exposed apply one additional coat of sealer prior to occupancy of building.

3.07 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.

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 testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure four concrete test cylinders. Obtain test samples for every 75 cu yd or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.

3.08 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and the General 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 Architect. The cost of additional testing shall be borne by the General Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 SCHEDULE - CONCRETE TYPES AND FINISHES

A. Footings: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 3000 psi.
   2. Slump Range: 3 to 5 inches.

B. Slab-on-Grade and Foundation Walls: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 4000 psi.
   2. Slump Range: 5 to 7 inches.

C. Elevated Slabs: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 days): 4000 psi
2. Slump Range: 5 to 7 inches.

D. Concrete Walks, Curbs, Paving:
1. Compressive strength (28 days): 4000 psi
2. Slump Range: 3 to 5 inches
3. Air Entrained

END OF SECTION

DIVISION 04

MASONRY

SECTION 04 0511
MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

b. Section 08 1113 – Hollow Metal Doors and Frames: Products and execution for grouting steel door frames installed in masonry.

1.03 REFERENCES

A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2013.

B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.

C. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.

E. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.

F. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.

G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

H. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

I. ASTM C476 - Standard Specification for Grout for Masonry; 2016.

J. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

K. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used.

C. Submit color of mortar samples.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Masonry Cement: ASTM C91, Type S, Type M.
   1. Acceptable product: use one brand throughout job.

B. Portland Cement: ASTM C150, Type II - Moderate; color as required to produce approved color sample.

C. Mortar Aggregate: ASTM C144.

D. Grout Aggregate: ASTM C404.

E. Water: Clean and potable.

F. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
   1. Acceptable product:
      a. W. R. Grace "Dry Mortar" additive.
      b. BASF “Hydrocide” Powder.

2.02 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. Do not use anti-freeze compounds to lower the freezing point of mortar.

D. If water is lost by evaporation, re-temper only within two hours of mixing.

E. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 50 degrees F.

F. Mortar Proportioning-Masonry Cement Mortar
   1. One part masonry cement and three parts sand

2.03 GROUT MIXES

A. Bond Beams, Lintels, and Foundation Walls: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94/C 94M or mix in accordance with ASTM C476.
   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.

2.04 GROUT MIXING

A. Mix grout in accordance with ASTM C94/C94M.
   1. Ready mixed concrete

B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
   1. Site mixed grout

C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
   1. Architect's approval required for all admixtures.

D. Do not use anti-freeze compounds to lower the freezing point of grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug clean-out holes for grouted masonry with brick or block masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

A. Install mortar and grout to requirements of section(s) in which masonry is specified.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.

D. Do not displace reinforcement while placing grout.

E. Remove excess mortar from grout spaces.

3.03 GROUTING

A. Perform all grouting by means of low-lift technique. Do not employ high-lift grouting.

B. Low-Lift Grouting:
   1. Limit height of pours to 48 inches.
   2. Limit height of masonry to 48 inches above each pour.
   3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
   4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.

3.04 SCHEDULES

A. Use Type "S" mortar for all masonry above grade.

B. Use Type "M" mortar for all masonry below grade.

END OF SECTION

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.
B. Clay Facing Brick.
C. Common Brick.
D. Reinforcement and Anchorage.
E. Flashings.
F. Lintels.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 2100 - Allowances: Brick allowance.
B. Section 03 3000 - Cast in Place Concrete: Reinforcing steel.
C. Section 04 0511 - Masonry Mortaring and Grouting.
D. Section 05 5000 - Metal Fabrications: Loose steel lintels.
E. Section 07 1113 - Bituminous Dampproofing.
F. Section 07 1900 - Water Repellants for Masonry Sealer.
G. Section 07 2113 - Board Insulation: Insulation for cavity spaces.
H. Section 07 6500 - Flexible Flashing
I. Section 07 9005 - Joint Sealers: Backing rod and sealant at control joints.
J. Section 09 9000 - Painting and Coating: Painting existing brick veneer.

1.03 REFERENCE STANDARDS

A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2005.
B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2005.
C. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
D. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
E. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009.
F. ASTM C 62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2005.
G. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2006b.
H. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2006.
I. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2007a.
J. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; 1993.
K. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data for fabricated wire reinforcement, mortar, and masonry accessories.

C. Samples: Submit 2 samples of facing units to illustrate color, texture, and extremes of color range.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.

1.06 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized as shown on drawings; include mortar and different masonry patterns and precast concrete trim in mock-up.

B. Mock-up may not remain as part of the Work.

1.07 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

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 x 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, and other detailed conditions.
   3. Load-Bearing Units: ASTM C 90, normal weight.
      a. Both hollow and solid block, as indicated.
      b. Exposed faces: Manufacturer's standard color and texture.
      c. ASTM C-90, Grade N, Type I.
      d. 125 lbs. or greater for normal weight block.
      e. Classification D-2 concrete blocks at 2 hr. rated walls.
   3. Non-Loadbearing Units: ASTM C 129.
      a. Hollow block.
      b. Lightweight.

2.02 BRICK UNITS

A. Facing Brick: ASTM C 216, Type FBS, Grade SW.
   1. Color and Texture: To be selected.
   2. Size: Modular. (2 5/8" x 3 5/8" x 7 5/8")
   3. Special Shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

B. Building (Common) Brick: ASTM C 62, Grade MW; cored units.
   1. Size: As indicated on drawings.

2.03 MORTAR AND GROUT MATERIALS

A. Mortar and grout: As specified in Section 04 0511.

2.04 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Dur-O-Wal: www.dur-o-wal.com.
   2. Hohmann & Barnard, Inc: www.h-b.com.
   3. Masonry Reinforcing Corporation of America: www.wirebond.com.

B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420) deformed billet bars; uncoated.

C. Single Wythe Joint Reinforcement: Truss type; ASTM A 82/A 82M steel wire, mill galvanized to ASTM A 641/A 641M, 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.
   1. Wire Bond - Series 300, 2 wire

D. Multiple Wythe Joint Reinforcement: Truss type; ASTM A 82 steel wire, mill galvanized to ASTM A 641/A 641M, 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 ½ inch of mortar coverage on each exposure.
   1. Wire Bond – Series 300, 3 wire

E. Adjustable Multiple Wythe Joint Reinforcement: Truss type with adjustable ties spaced at 16 in on center ASTM A 82 steel wire, mill galvanized to ASTM A 641/A641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire; width of components as required to provide not more than 1 inch and not less than ½ inch of mortar coverage from each masonry face.
   1. Vertical adjustment: Not less than 1-1/4 inches.
   2. Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1875 inch diameter.
   3. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.
   4. Wire Bond – Series 900

D. 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 0.105 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
   2. Wire ties: Trapezoidal shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 1-1/4 inches.
   4. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
   5. Wire Bond - Series RJ-711 with 2401 plate and 2402 hook.
   6. Screws: 5/16 inch diameter, co-polymer coated, self-drill, self-tap; 2 screws per plate.

2.05 FLASHINGS

A. Through Wall Flashing: Copper fabric as specified in Section 07 6500.

2.06 ACCESSORIES

A. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Dur-O-Wal: www.dur-o-wal.com.
      b. Hohmann & Barnard, Inc: www.h-b.com.

c. Masonry Reinforcing Corporation of America: www.wirebond.com.

B. Tape: Multi-ply polyethylene/polymer-modified asphalt membrane.
1. Use behind all veneer ties at masonry veneers to stud walls.
2. 2 inch wide tape; 40 mil thick
3. Manufacturer: Hohmann & Barnard, Inc., "Textroseal".

C. Joint Filler: Closed cell polyurethane; oversized 50 percent to joint width; self-expanding; width as required x by maximum lengths available.

D. 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.

E. Weeps Vents: Provide at all weep locations indicated on drawings.
1. Non-woven mesh with M-notch bottom.
2. Size: 3/8 inch x 3 ½ inches high x full depth of masonry.
3. Color to be selected by architect to match mortar color.
4. Manufacturer: Cavclear Weep Vents as manufactured by Archovation, Inc., PO Box 241 Hudson, WI 54016, (888) 436-2620.

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 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: (concrete block)
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.

E. Minor deviations in location of door or window openings to make work course out will be at the contractor's discretion; major changes must have approval of architect.

3.04 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. Interlock intersections and external corners.

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, cement parging is required, resilient base is scheduled, cavity insulation vapor barrier adhesive is applied, or bitumen damp proofing is applied.

I. Install control joints as indicated.

J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 WEEPS/CAVITY VENTS

A. Install weeps in walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, at bottom of walls, and as indicated on the drawings.

3.06 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier adhesive.

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.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
   1. 8" o.c. at walls below grade to be filled with concrete

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 16 inches horizontally and 16 inches vertically.

3.08 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

3.09 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced as shown on the drawings.

F. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

3.10 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches.

E. Masonry Back-Up: Embed anchors to bond 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 16 inches on center.

F. 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 16 inches on center.

G. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

H. Use adjustable multiple wythe joint reinforcing at masonry veneer to concrete block back-up.

3.11 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.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
   2. Remove or cover protrusions or sharp edges that could puncture flashings.
   3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Extend metal flashings to within 1/4 inch of exterior face of masonry.

C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.12 LINTELS

A. Install loose steel lintels over openings.
   1. All lintels shall have a minimum of 8 inches bearing on each end.

3.13 GROUTED COMPONENTS

A. Reinforce bond beams as shown on the drawings.

B. Reinforce and fill block walls with concrete as shown on the drawings.

C. Place and consolidate grout fill without displacing reinforcing.

3.14 CONTROL JOINTS

A. In general, do not continue horizontal joint reinforcement through control joints. See specific notes on structural drawings.

B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

D. Size control joint in accordance with Section 07 9005 for sealant performance.

E. Form expansion joint as detailed.

3.15 BUILT-IN WORK

A. As work progresses, install built-in wood nailing strips, and anchor bolts 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 frames in adjacent mortar joints. Fill frame voids solid with grout.

1. Fill adjacent cores with grout minimum 8 inches from framed opening.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.16 TOLERANCES

A. Maximum Variation from Alignment of Columns and Pilasters: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.17 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.

3.18 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.

E. Use of acids for cleaning masonry will not be allowed.

3.19 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

3.20 MASONRY SEALER

A. Treat all exposed masonry with sealer as specified in Section 07 1900.

3.21 SCHEDULES

A. Concrete Block: Load Bearing (normal weight)
   1. Foundation Walls, Load Bearing Walls, and all work below grade.
   2. Exterior Walls (screen walls)

B. Concrete Block: Non-Load Bearing (light weight)
   1. Exterior low walls at planter, ramps, and steps above grade.

C. Face Brick:

1. Exterior Veneer.

D. Common Brick:

1. Allowed at veneer work below grade.

END OF SECTION

DIVISION 05

METALS

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members, sag rods, and struts.

B. Base plates, shear stud connectors, and expansion joint plates.

C. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 01 4329 - Special Inspections.

B. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

C. Section 06 1000 – Rough Carpentry: Wood stud framing.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2005.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2005.

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts; 2004.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2007.

F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2007.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

H. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2007b.

I. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2009a.

J. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2009.

K. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 ksi Minimum Tensile Strength; 2009.

L. ASTM A490M - Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric); 2009a.

M. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010.

N. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

O. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2006a.

P. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2008.

Q. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments; 2008.

R. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2009.

S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2007.

T. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2010.

U. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
   5. Include embedment drawings.
   6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
   7. Reproduction of contract drawings, in any form, will not be accepted as shop drawings.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Shear stud connectors.
   4. Shop primers.

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. Contractor shall submit three (3) copies of shop drawings for approval. Two (2) copies will be retained by architect/engineer. Contractor shall reproduce shop drawings as required after review by architect/engineer.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."

B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
   1. AISC "Seismic Provisions for Structural Steel Buildings" and supplements.

C. AISC "Specification for Structural Steel Buildings-Allowable Stress Design and Plastic Design".

D. RCSC's "Specification for Structural Joints using ASTM A 325 or A490 Bolts".

E. Fabricator: Company specializing in performing the work of this section with minimum three years of documented experience.

F. Erector: Company specializing in performing the work of this section with minimum three years of documented experience.

G. 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 in which the Project is located.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
   1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.07 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Steel Shapes, Plates, and Bars: ASTM A 242/A 242M high-strength, corrosion-resistant structural steel.

E. Steel Plates and Bars: ASTM A572/A572M, Grade 50 (345) high-strength, columbium-vanadium steel.

F. Cold-Formed Structural Tubing: ASTM A500, Grade B.

G. Hot-Formed Structural Tubing: ASTM A501, seamless or welded.

H. Steel Bars: ASTM A108.

I. Steel Plate: ASTM A514/A514M.

J. Steel Sheet: ASTM A1011/A1011M, Designation SS, Grade 30 hot-rolled, or ASTM A1008/A1008M, Designation SS, Grade 30 cold-rolled.

K. Pipe: ASTM A53/A53M, Grade B, Finish black.

L. Shear Stud Connectors: Made from ASTM A 108 Grade 1015 bars.
   1. AWS D1.1, Type B.

M. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A galvanized to ASTM A 153/A 153Mm Class C

N. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, medium carbon, galvanized.

O. High-Strength Structural Bolts: ASTM A490 (ASTM A490M), with matching ASTM A563 (ASTM A563M) nuts and ASTM F436 washers; Type 1 alloy steel.

P. Anchor Rods: ASTM F1554, Grade 55.

Q. Load Indicator Washers: Provide washers complying with ASTM F959 at all connections requiring high-strength bolts.

R. Welding Materials: AWS D1.1; type required for materials being welded.

S. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days. Provide "100 Non-Shrink Grout" manufactured by Conspec.

T. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
   1. Lead free alkyd primer; Tnemec 10-99 Series, Southern Coatings Environ-Guard 1-2900, or approved equal, meeting performance requirements of TT-P-86, Type I and passing ASTM B 117 after 500 hours with no blistering, cracking, softening, delamination, or rust creepage at scribe and rusting at edges.

U. 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.

B. Space shear stud connectors as shown on drawings.

C. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

D. Fabricate connections for bolt, nut, and washer connectors.

E. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP -2 and SP-3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete, high strength bolted, or field installed headed studs.
   1. Dry film thickness of not less than 2 mils.

C. Galvanize structural steel members to comply with ASTM A123/A123M. Provide minimum 1.7 oz/sq ft galvanized coating.

2.04 SOURCE QUALITY CONTROL

A. Provide shop testing and analysis of structural steel.
   1. Members to be tested: Beam to beam/column and column to column.
   2. Percentage tested: 10%.
   3. Test method: Ultrasonic, ASTM E 164 or other approved means.

B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.

C. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using the following:
   1. Ultrasonic testing performed in accordance with ASTM E 164 or other approved means.

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 "Code of Standard Practice for Steel Buildings and Bridges".

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 shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. Do not field cut or alter structural members without approval of Architect.

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 ERECTION 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 will perform field quality control tests, as specified in Section 01 4000.

B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", testing at least 10 percent of bolts at each connection.

C. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using the following:
   1. Ultrasonic testing performed in accordance with ASTM E 164 or other approved means.

END OF SECTION

SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Miscellaneous Metals:
   1. Structural shapes for miscellaneous beams, columns, lintels, frames for wall, roof, and floor openings, miscellaneous bracing for door and window heads, anchor plates, inserts, clip angles, etc.
   2. Structural shapes for mechanical supports, frames and openings and thru-the-roof supports for mechanical equipment.
   3. Bearing plates for beams and anchors.
   4. Bolts and studs.
   5. Miscellaneous bracing angles and support angles.
   6. Steel lintels.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04 2000 – Unit Masonry.

C. Section 05 5213 – Pipe and Tube Railings.

D. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2002.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

C. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2004a.

D. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.

E. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003.

F. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2004b.

G. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.

H. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1998.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2004 and errata.

J. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).

K. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002.

L. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, 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.

1.05 QUALITY ASSURANCE

A. All fabrication to be completed by a firm regularly engaged in metal fabrications with a minimum of three year's experience.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.

C. Plates: ASTM A 283.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Bolts, Nuts, and Washers: galvanized to ASTM A 153/A 153M where connecting galvanized components.

F. Welding Materials: AWS D1.1; 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. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint or galvanized finish; see drawings.

B. Lintels: As detailed; prime paint or galvanized finish; see drawings.

2.04 FINISHES - STEEL

A. Prime paint all steel items.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry and items specified for galvanized finish.
   2. 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 A 123/A 123M requirements.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M 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.

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 indicated.

D. Perform field welding in accordance with AWS D1.1.

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 ERECTION 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.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails for stairs, steps, and ramps

1.02 RELATED REQUIREMENTS

A. Section 03 3000 – Cast-in-Place Concrete.

B. Section 09 2116 – Gypsum Board Assemblies.

C. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A 53/A 53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2004a.

B. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.

C. ASTM E 985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000.

D. SSPC-Paint 15 - Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2000).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E 985 and applicable local code.

B. Design railing assembly, wall rails, and attachments to resist lateral force of 300 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.

C. Allow for expansion and contraction of members and building movement without damage to connections or members.

D. Provide anchors and all 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 stud walls, provide backing plates, for bolting anchors.
   2. Posts: Provide adjustable flanged brackets.

E. Dimensions: See drawings for configurations and heights. (Stair A-1)
   1. Hand Rails: 1-1/2 inches outside diameter, round, standard steel pipe.

F. Provide welding fittings 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 SYSTEMS

A. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: No exposed bolts or screws.

D. Straight Splice Connectors: Steel concealed spigots.

E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

F. Interior Stair Railings:
   1. Hand Rails: 1-1/2" outside diameter steel pipe
      a. Hand rails mounted to wall

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

E. 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.

F. Provide closure at ends of handrails.

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 ERECTION 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.

END OF SECTION

DIVISION 06

WOOD, PLASTICS AND COMPOSITES

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Lay-out.

B. Structural wall and roof framing.

C. Built-up structural beams and columns.

D. Preservative treatment of wood.

E. Miscellaneous framing and sheathing.

F. Telephone and electrical panel boards.

G. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and wall mounted metal railings.

H. Miscellaneous wood nailers and furring strips.

1.02 RELATED REQUIREMENTS

A. Section 01 3223 - Survey and Lay-out data.

B. Section 06 1001 - Fasteners and Anchorage

C. Section 06 1636 - Wood Panel Product Sheathing

D. Section 06 1723 – Parallel Strand Lumber

E. Section 06 1733 - Wood I-Joists

F. Section 07 6200 - Sheet Metal Flashing and Trim.

G. Section 09 2116 – Gypsum Board Assemblies

1.03 REFERENCE STANDARDS

A. AFPA T10 - Wood Frame Construction Manual; American Forest and Paper Association; 2001.

B. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood-Preservers' Association; 2005.

D. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

E. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association; 2011.

1.04 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Product Data: Provide technical data on sheathing, wood preservative materials, and application instructions.

C. Manufacturer's certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee.
   2. Acceptable Lumber Inspection Agencies: SPIB and WWP.
   3. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER

A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).

B. Grading Agency: Western Wood Products Association (WWPA).

C. Sizes: Nominal sizes as indicated on drawings, S4S.

D. Moisture Content: Kiln-dry or MC15.

E. Stud Framing (Load Bearing):
   1. Species: Southern Pine, #2, K.D.
   2. Hem-Fir, #1
   3. Spruce - Pine - Fir, #1

F. Joist and Rafter Framing:
   1. Species: Southern Pine, K.D.
   2. Grade: No. 2.
   3. Use for all structural lumber except load bearing studs.

G. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2, Southern Pine.

H. See structural drawings.

2.03 EXPOSED BOARDS

A. Moisture Content: Kiln-dry (15 percent maximum).

B. Surfacing: S4S.

C. Species: Southern Pine.

D. Grade: No. 1, 1 Common, or Select.

2.04 CONSTRUCTION PANELS

A. Telephone and Electrical Panel Boards
   1. APA rated sheathing, fire retardant treated.

B. Adhesive/Glue
   1. APA AFT-01
   2. Waterproof
   3. Water base, air cure type
   4. Cartridge dispensed

C. See Section 06 1636 – Wood Panel Product Sheathing for all other wood panel applications

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Pressure Treatment of Lumber Above Grade: AWPA Use Category UC3B, Commodity Specification A (Treatment C2) using waterborne preservative to 0.25 lb/cu ft. retention.
   1. Kiln dry lumber after treatment to maximum moisture content of 12 percent.
   2. Treat lumber in contact with masonry or concrete, or any wood exposed to weather.
   3. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 BUILDING LAY-OUT

A. Lay-out the building using batter boards placed not less than 4'-0" outside of building lines and left in place until all walls are above grade. No excavation shall be started until all lines have been established and dimensions are checked and finish floor elevation is checked by the architect. See Section 01 3223.

B. Carpentry work shall include full responsibility for the accurate laying out of the building and the work of all subcontractors, mechanical and electrical contractors, and to see that their work shall not interfere with the structural parts of the building.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shim, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminates.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. 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.

E. Install horizontal spanning members with crown edge up and not less than 3 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame openings with two or more studs at each jamb; support headers on cripple studs.

I. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, trim, and metal railings.

3.04 NAILING/FRAMING

A. Wood Stud Partitions:
   1. General: Construction to be as herein outlined.
      a. Exterior Walls and Interior Load Bearing Walls:
         1) Single 2 x 6 sole plate set in full bed of caulking around complete building perimeters at first floor slab. Double 2 x 4 sole plate at upper floors; Double sole plate at floors to accommodate cast underlayment.

2) 2 x 6 wall studs at 1'-4" on center, block bridged once between floor and ceiling. Headers of size as shown on plans, double studs at openings.
3) Double 2 x 6 top plate. Joints must occur centered on studs, be joined with a tie plate and each be anchored to the stud over which it rests.

b. Interior Partitions: Non-Load Bearing
1) Single 2 x 4 or 2 x 6 sole plate.
2) 2 x 6 or 2 x 4 wall studs at 1'-4" on center; block bridged once between floor and ceiling, headers of size shown on plans, double studs at opening jambs.
3) Double 2 x 4 or 2 x 6 top plate (See a., 3. above).

2. Notches:
a. General: Studs may be notched 1/4 their depth to receive piping or conduit, or may be drilled to a maximum of 1¼" in 2 x 4 studs or 2" in 2 x 6 studs.
b. Exterior Walls: Wiring raceways to be notched in bottom of 2 x 4 studs in exterior walls to allow wiring to lay against sole plate to prevent any interference with proper installation of insulation.

3. Nailing Framing, etc.:
a. Studs: Shall be nailed to the sole plate with 3-10d or 4-6d toenails or 2-16d end nails. Provide at exterior walls, 18 gauge galvanized steel strap at every other stud with 4-6d nails in each end of strap or use metal anchors designed for this purpose.
b. Top Plates: Shall be lapped at corners and intersecting partitions and nailed together with 3-10d nails or butted and tied with 18 gauge galvanized metal strap with 4-6d nails in each end of strap. End of top plate lower members shall occur over studs. Joints in upper member of plates shall occur at least 24" from joints lower member. Nail lower member of plate to each stud with 3-10d end nails. Upper plate member shall be fastened to lower member with 16d common nails at 16" on center when plates are cut more than 1/2 their width for piping and etc., reinforce with 18 gauge steel straps.
c. Corner Construction: Shall not be less than three 2 x 4's set to receive interior finish. Corner posts members shall be nailed to each other and to filler blocks, if used, with 16d nails not more than 24" on center in each face, with at least three nails into each filler block.
d. Framing Openings: Shall be framed to provide a rigid enclosure. Jamb stud shall extend in one piece from header to sole plate. Double studs shall be used at all openings. Nail inner stud to outer stud with 16d nails, 24" on center. Toenail inner stud to wall plate with 2-8d nails or end nail with 2-16d nails to top plate with 2-8d nails or end nail with 2-16d nails to top plate with 2-8d nails (toenails).
e. Blocking-Reinforcing: Provide solid blocking within partition to support all plumbing fixtures, counters, and cabinets, and bath accessories.
f. See Section 06 1001, Fasteners.

B. Rafters: Rafters shall be TJI Joists and cut for even bearing and attached per structural drawings.

C. Pneumatic Nailing:
1. Pneumatic nailing may be substituted for common nails under the following conditions:
a. Pneumatic nail substitute for 8d common nails shall have a minimum diameter of 0.131" and length of 2½".
b. For 10d common nails substituted pneumatic nails shall have a minimum diameter of 0.148" and length of 3".
c. T-head nails or staples are not acceptable.

3.05 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.06 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Coordinate installation of wood decking, truss joists, laminated structural units, and prefabricated wood trusses.

B. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

C. Coordinate curb installation with installation of decking and support of deck openings.

3.07 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.

END OF SECTION

SECTION 06 1001
FASTENERS AND ANCHORS

PART I—GENERAL

1.01 SECTION INCLUDES

A. Fasteners for connecting wood member together.

B. Fasteners for anchoring wood framing to slabs and foundations.

C. Special anchorage and fasteners to meet earthquake code.

D. Fasteners as shown and detailed on the drawings.

1.02 RELATED SECTIONS

A. Section 06 1000 – Rough Carpentry

B. Section 06 1723 – Parallel Strand Lumber

C. Section 06 1733 – Wood I Joists

1.03 REFERENCES

A. ASTM A 36/A 36M – Standard Specification for Carbon Steel.

B. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 2004

C. ASTM A 153/A 153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2003.

D. ASTM A 653/A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2003.

1.04 SUBMITTALS

A. See Section 01 3323, Submittals, for submittal procedures.

B. Product Data: Provide technical data and manufacturer's catalogue information on all fasteners.

C. Installation Instructions: Provide manufacturer's printed installation instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the types of products specified in this section and with minimum 10 years of documented experience.

B. Manufacturer to provide load tables for all products based on the 2001 National Design Specifications.

C. All connectors to meet IBC 2012 Building Code.

D. Installer: Company with proven experience in performing installation of products under this section.

PART II—PRODUCTS

2.01 MANUFACTURERS

A. Simpson Strong-Tie Company, Inc., Dublin, CA.

B. Hilti, Tulsa, OK

C. USP Structural Connectors, Indianapolis, IN

2.02 MATERIALS

A. Steel: ASTM A-36

B. Rods and Anchor Bolts: ASTM A307 Grade A

C. Metal and Finish: Hot dipped galvanized steel per ASTM A153/A 153M.

D. Nails, Screws, and Anchorage: Per manufacturer's recommendations or as shown on the drawings.

2.03 FINISH

A. All products to be galvanized per ASTM 1 153/A 153M.

B. All products in contact with treated wood to be G185 galvanized per ASTM A 653/A 653M.

PART III—EXECUTION

3.01 INSTALLATION

A. Install at locations as shown on the drawings.

B. Install fasteners in strict accordance with manufacturer's printed instructions and as detailed on the drawings.

3.02 SCHEDULES

A. Including but not limited to the following:

1. Exterior Wall to Floor Slab: Anchor bolts per structural drawings.
2. Unsupported Edges of Roof Deck: Ply Clips or "H" clips.
3. Interior Non-Bearing Partitions to Slab: See structural drawings.
4. Interior Load Bearing Walls: See structural drawings.
5. TJI Rafter Joist to Wall: Simpson "H2.5A"
6. Coat all fasteners in contact with treated lumber with G185 galvanization.
7. Shear Wall Hold Downs: Simpson HDUII-SDS2.5 with 1" diam. Anchor bolts.
8. Epoxy Anchors: As indicated on the structural drawings.

B. See structural drawings.

END OF SECTION

SECTION 06 1636
WOOD PANEL PRODUCT SHEATHING

PART I-GENERAL

1.01 SECTION INCLUDES

A. Wall Sheathing

B. Roof Decking

C. Floor Decking

1.02 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry

B. Section 06 1001 - Fasteners and Anchors

C. Section 06 1723 - Parallel Strand Lumber

D. Section 06 1733 - Wood I Joists

1.03 REFERENCES

A. PS-1: Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce);1995

B. APA Trademark: The Engineered Wood Association.

C. ASTM D-2555: Design Stresses, Group Assignment.

1.04 QUALITY ASSURANCE

A. Plywood type, grade, and species group shall be specified as outlined in the latest edition of "Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood."

B. OSB panels to be manufactured in conformance with "Voluntary Product Standard PS-2" or APA PRP-108 performance standards.

C. All sheathing panels are to be stamped with APA Trademark showing panel grade, span rating, exposure classification, thickness, mill number, and performance-rated panel standard.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and allow air circulation.

B. Prevent exposure to precipitation during shipping, storage or installation.

PART II-PRODUCTS

2.01 MATERIALS

A. Wall Sheathing: APA Rated OSB (Oriented Strand Board)
   1. Structural 1
   2. Exposure Class: Exposure 1
   3. Span Rating: 24/16
   4. Thickness: 7/16"

B. Roof Decking: APA Rated OSB
   1. Decking
   2. Exposure Class: Exposure 1
   3. Span Rating: 40/20
   4. Thickness: 5/8"

C. Subfloor: APA Rated Plywood Floor Deck
   1. Exposure Class: Exterior
   2. Span Rating: 24" o.c.
   3. Thickness: ¾"

4. Tongue and Grove Floor Deck
5. 5-ply Plywood
6. Sturd-i-Floor

D. Adhesive/Glue
1. APA AFG-01
2. Waterproof
3. Water base, air cure type
4. Cartridge dispensed

2.02 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.

B. Fire Retardant Treatment:
1. Interior Type A: AWPA Use Category UCFA, Commodity Specification H (Treatment C20 for lumber and C27 for plywood), low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread rating of 25 when tested in accordance with ASTM E 84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART III-EXECUTION

3.01 INSTALLATION-WALL SHEATHING

A. Install wall sheathing vertically to wall studs.

B. Butt joints and nail sheathing per structural drawings.

3.02 INSTALLATION-WALL SHEATHING, SHEAR PANELS

A. See structural drawings for location of wall shear panels.

B. Glue and nail per size and pattern as shown on structural drawings.

3.03 INSTALLATION-ROOF DECKING

A. Install panels with face grain across supports, stagger end joints.

B. Butt panel ends to a close but tight fit; allow 1/8" space.

C. Nail panels per structural drawings.

D. Provide clips at intermediate points between framing at roof sheathing; see Section 06 1001.

3.04 INSTALLATION-SUBFLOOR

A. Install tongue and groove subflooring/floor deck with face grain across supports, stagger panel end joints.

B. Butt panel ends to a close fit; 1/16" space at all edges.

C. Glue panels with adhesive applied in 3/8" diameter beads to top of joists and ¼" diameter beads to tongue and groove joints.

D. Nail per structural drawings.

END OF SECTION

SECTION 06 1723
PARALLEL STRAND LUMBER

PART I—GENERAL

1.01 SECTION INCLUDES

A. Parallel strand lumber structural members scheduled as "Parallam Beam" on the drawings.

1.02 RELATED SECTIONS

A. Section 06 1000, Rough Carpentry

B. Section 06 1001, Fasteners and Anchors

1.03 REFERENCES

A. NES, Report No. NER-481, National Evaluation Service, Inc.

B. ASTM D-2559 – Standard Specification for Adhesives for Structural Laminated Wood Products; 2004

C. ASTM D-5456 – Standard Specification for Evaluation of Structural Composite Lumber Products; 2005

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Shop drawings showing lay-out and detail necessary for determining fit and placement in the building to be provided by the manufacturer.

C. Production: Do not proceed with fabrication and/or cutting until shop drawings have been reviewed by the architect.

D. Manufacturer's product data and load tables.

1.05 QUALITY ASSURANCE

A. These products shall be designed and manufactured to the standards set forth in the National Evaluation Service, Inc. (NES) Report No. NER-481.

B. Parallel strand lumber shall be manufactured in a plant recognized by the building code and under the supervision of an approved third party inspection agency. It shall be manufactured in a continuous process with all grain parallel with the length of the member.

C. Identification: Parallel strand lumber shall be identified by a stamp indicating the product type and grade, NER report number, manufacturer's name, plant number, and the independent inspection agency's logo.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturers name and product identification intact and legible.

B. Protect products from damage due to weather and breakage.

C. Protect members from warping or other distortion, with air circulation under coverings and around stacks.

PART II—PRODUCTS

2.01 MANUFACTURERS

A. Parallel strand lumber to be manufactured by Trus Joist MacMillan or equal.

2.02 MATERIALS

A. Code Reports: Materials shall comply with NES Report No. NER-481.

B. Veneer: Wood veneers ultrasonically graded or graded by other advanced grading systems.

C. Adhesives: Adhesives shall be of the waterproof type conforming to the requirements of ASTM D-2559.

D. Allowable Design Stresses:
   1. Horizontal sheer = 210psi.
   2. Modulus of elasticity: E = 2.0 x 10 (to the 6th power) psi
   3. Flexural stress: F sub b = 2,900 psi
   4. Tension parallel to grain = 2,400 psi
   5. Compressive strength = 2,900 psi

E. Tolerances:
   1. Finished Length: ± ¼"
   2. Depth: ± 1/16"
   3. Width: ± 1/16"

2.03 FABRICATION

A. Parallel strand lumber, PSL, shall be manufactured from strands of wood fiber in a continuous process with all strands oriented to the length of the member and then fed into a press in the desired lay-up pattern. All members are to be free of finger joints or scarfs or mechanical connections in full length members.

PART III—EXECUTION

3.01 ERECTION AND INSTALLATION

A. PSL, if stored prior to erection, shall be protected from the weather. It shall be erected and installed in accordance with the plans and manufacturer's drawings and installation suggestions which may be provided. Holes, cuts or notches not previously approved by engineering shall not be permitted. Temporary construction loads which cause stresses beyond design limits are not permitted.

B. Connections: Lateral nail and withdrawal holding values are as provided in the code for Douglas Fir sawn lumber. Nails installed perpendicular to the glue lines on the wide face shall be installed in accordance with the code. Nails installed parallel to the glue lines on the narrow face shall not be spaced closer than 3 inches for 8-penny common nails and 4 inches for 10-penny common nails. These nailing specifications are based on a member at least ¾ inches thick and 3½ inches wide. Holding power of bolts installed perpendicular to the glue lines is as provided in the code for Douglas Fir.

3.02 INSPECTION

A. The contractor shall give notification to the manufacturer's representative prior to enclosing the PSL to provide opportunity for inspection of the installation.

END OF SECTION

SECTION 06 1733
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood I-joists for floor framing and roof framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry.

B. Section 06 1001 - Fasteners and Anchors.

C. Section 06 1636 - Wood Panel Product Sheathing

D. Section 06 1723 - Parallel Strand Lumber

1.03 REFERENCE STANDARDS

A. ASTM D 2559 - Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions; 2009.

B. ASTM D 5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists; 2004.

C. PS 1 - Construction and Industrial Plywood; 1995.

D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2004.

E. NES - Report No. NER-200, National Evaluation Service, Inc.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.

C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.

D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. These products shall be designed and manufactured to the standards set forth in the National Evaluation Service, Inc. (NES) Report No. NER-200.

C. Identification: Joists shall be identified by a stamp indicating the joist type, NER report number, manufacturer's name, plant number, and the independent inspection agency's logo.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.

B. Protect products from damage due to weather and breakage.

C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.

D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood I-Joists:
   1. Trus Joist/Weyerhaeuser; Product "TJI Pro Series": www.trusjoist.com.

2.02 MATERIALS

A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive; with published span rating as shown below.
   1. Span Rating: Established and monitored in accordance with ASTM D 5055 by independent inspection agency.
   2. Oriented Strand Board: Comply with PS 2.
   3. Plywood: Comply with PS 1.
   4. Adhesive: Tested for wet/exterior service in accordance with ASTM D 2559.
   5. Depth: As indicated on drawings.
   6. Fabrication Tolerances:
      a. Flange Width: Plus/minus 1/32 inch.
      b. Flange Thickness: Minus 1/16 inch.
      c. Joist Depth: Plus 0, minus 1/8 inch.
   7. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.
   8. Provide bearing stiffeners if required by span rating or joist hanger manufacturer.

B. Minimum Properties:
   1. Depth: 16 inches
   2. TJI 230
   3. Weight: 3.5 lbs. per ft.
   4. Maximum Resistive Moment: 5,710 ft-lbs.
   5. Joist only, E1 x 10 (to 6th power): 691 inch squared-lbs.
   6. Maximum Vertical Shear: 2,190 lbs.
   7. 1-3/4" End Reaction: 1,060 lbs.
   8. 3-1/2" Intermediate Reaction:
      a. 2,410 lbs. no web stiffeners
      b. 2,765 lbs. with web stiffeners

C. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

D. Joist Hangers: See Section 06 1001.

E. Joist Bridging: Type, size and spacing recommended by joist manufacturer or as shown on the structural drawings.

F. Wood Blocking, Plates, and Opening Framing: Softwood, construction grade, maximum moisture content of 19 percent.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive joists.

B. Verify that field measurements are as indicated on shop drawings.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install joists in accordance with manufacturer's instructions.

B. Set structural members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Brackett Krennerich Architects.

E. Place permanent bridging and bracing.

F. Place headers and supports to frame openings required.

G. Frame openings between joists with lumber in accordance with structural drawings.

H. Coordinate placement of decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood trim.

C. Wood wall caps.

D. Wood window sills.

E. Door installation.

F. Includes items shown on drawings as millwork; designated "MW".

1.02 RELATED REQUIREMENTS

A. Section 06 1000-Rough Carpentry

B. Section 06 4116 – Laminate Clad Millwork

C. Section 09 9000 - Painting and Coating: Painting and finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2003.

B. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2003.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.

B. Grade materials in accordance with the following:
   1. Lumber Grading Agency: Certified by ALSC.
   2. Plywood: Certified by the American Plywood Association.
   3. Hardwood Lumber Grading: NHLA Grading Rules.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

1.06 PROJECT CONDITIONS

A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 PRODUCTS

2.01 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.02 LUMBER MATERIALS

A. Hardwood Lumber: Poplar and Birch species, plain sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
   1. K.D., S4S, Grade 1, 1 x material

2.03 SHEET MATERIALS

A. Hardwood Plywood: HPVA HP-1, Grade AA, Type II; Veneer core and MDF core, type of glue recommended for application.

1. Equal to fibercore plywood units as manufactured by Columbia Forest Plywood Company, Trumann, Arkansas; 870-483-6408.
2. Poplar face species, plain sawn.
3. Medium density fibercore (MDF); 3ply
4. Back Face: Mill Option.
5. Thickness: ¼" thick
6. Size: 4'-0" x 10'-0" and 4'-0" x 12'-0" as required and as shown on the drawings.
7. Fasteners:
   a. Use Type S, bugle head screws for attaching panels to metal studs (through gypsum board); length as required for thickness used.
   b. Adhesive: F-26 construction adhesive.

2.04 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

B. Ramp edge detail equal to "657"; 1/2" tall x 6" wide aluminum ramp edge by National Guard Products, Inc.; www.ngp.com. Refer to ramp details at courtroom.

2.05 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.

C. SHOP FINISHING
   1. Sand work smooth and set exposed nails and screws.
   2. Apply wood filler in exposed nail and screw indentations.
   3. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

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.

C. See Section 06 1000-Rough Carpentry for installation of recessed wood blocking.

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.

3.03 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth. It is intended that all screws be hidden by trim.

B. Site Finishing: See Section 09 9000.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 WORKMANSHIP

A. General: All work shall be accurately and neatly installed without hammer marks or any defacement. All finish nailing shall be set below the surface of finish, all cuts, miters and connections to adjacent work shall be accurately fitted and scribed into place. All lumber of finish carpentry work shall be belt sanded on faces and edges before use. Trim and molding shall be sanded before fitting into place. Doors shall be hand sanded. Shelving shall have faces and edges before placing on job. All items of finished carpentry shall be thoroughly sanded when installed.

B. Wood Doors: Trim and fit all doors to hang and operate without binding. Carefully install hardware to close doors without forcing and to prevent rattle. After hanging doors, remove, sand top and bottom edges and have painter paint top and bottom with clear varnish sealer.

C. Finish Hardware: Receive, store, and assume responsibility for finish hardware. Fit hardware accurately, apply securely and adjust carefully. Leave all hardware in working order and free from defects.

3.05 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.06 SCHEDULE

A. All interior trim: Use hardwood lumber as specified.

1. Wood Trim.
2. Wood Window Sills.

END OF SECTION

SECTION 06 4116
LAMINATE CLAD MILLWORK

PART 1-GENERAL

1.01 SECTION INCLUDES

A. Fabrication and installation of fixed modular and flexible rail mounted laminate clad casework and components.

B. Fixed modular countertops and related products.

C. Fixed courtroom millwork including judges bench, jury box, and rail.

D. Fixed quorum court millwork.

E. Includes items shown on drawings as millwork; designated "MW".

1.02 RELATED SECTIONS

A. Sinks and service fixtures, service and waste lines and all connections, vents, electrical service fixtures, hoods and ducting within or adjacent to millwork or otherwise required: Furnished and installed under Mechanical and Electrical Divisions 22 and 26.

B. Base Molding: Furnished and installed under Finishes Division 9.

C. Section 06 2000 – Finish Carpentry

D. Section 06 4117 - Cabinet Hardware

1.03 REFERENCES

A. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2000

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2002.

C. ANSI A208.1 - American National Standard for Particleboard; 1999.

D. ANSI A161.1 - Testing Standards; current year.

E. AWI 1600 - Architectural Woodwork Institute, Standards for Modular Cabinets.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Samples:

1. Submit samples of millwork manufacturer's standard decorative laminate colors, patterns and textures for exposed and semi-exposed materials for architect's selection. Samples of other materials or hardware will be available if requested.
2. Architect may request representative full-size samples for evaluation prior to approval. Samples may be impounded by architect/owner until completion of project to ensure compliance with specifications.

C. Shop Drawings: Submit shop drawings for architect's approval prior to fabrication of millwork. Drawings to include dimensional lay-out, construction details, cabinet elevations, and shelving elevations.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with AWI-1600 - Standards for modular cabinets.

B. Products meeting or exceeding ANSI A161.1 - Testing Standards.

C. Manufacturer's Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver completed laminate clad millwork, countertops, and related products only after wet operations in building are completed, store in ventilated place, protected from the weather, with relative humidity range of 25 percent to 55 percent.

B. Protect finished surfaces from soiling and damage during handling and installation with a protective covering.

1.07 JOB CONDITIONS

A. Environmental Requirements: Do not install millwork until permanent HVAC systems are operating and temperature and humidity have been stabilized for at least 1 week.
   1. Manufacturer/Supplier shall advise Contractor of temperature and humidity requirements for architectural casework installation areas.
   2. After installation, control temperature and humidity to maintain relative humidity between 25 percent and 55 percent.
   3. Conditions: Do not install casework until interior concrete work, masonry, plastering and other wet operations are complete.

1.08 WARRANTY

A. All materials and workmanship covered by this section will carry a five (5) year warranty from date of acceptance.

PART 2-PRODUCTS

2.01 MATERIALS

A. Core Materials:
   1. Particleboard: Medium density 45-50 pound industrial grade particleboard of fir or pine meeting or exceeding ANSI A 208.1, M-3 requirements. Thickness used is 3/4".
   2. Nailer strips: 1/4" Dunnage. Preferably Hardboard or MDF

B. Decorative Laminates:
   1. High-pressure decorative laminate GP28 (.028), NEMA; TEST LD-3-1995
   2. High-pressure decorative laminate GP50 (.050), NEMA; TEST LD-3-1995
   3. High-pressure decorative laminate PF42 (.042), NEMA; TEST LD-3-1995
   4. High-pressure cabinet liner CL20 (.020), NEMA; TEST LD-3-1995
   5. Thermally Fused Melamine laminate tested to meet NEMA TEST LD-3-1995
   6. High-pressure backer BK20 (.020)

C. Laminate Color Selection:
   1. Selections for cabinet surfaces, grade GP28, to be selected from the current year Wilsonart, Nevamar, Formica series. A maximum of one (1) color to be selected per unit face and five (5) colors per project. Standard colors in standard finishes.
   2. Selections for countertop grades, GP50 and PF42, shall be selected from the current year Wilsonart, Nevamar, Formica standard solid and pattern offering. A maximum of five (5) colors per project. Standard colors in standard finishes.
   3. Basic cabinet body color to include surfaces of all components, including drawer boxes in white to match Metabox slides, to be covered with melamine laminate as a minimum requirement.

D. Edging Materials:
   1. 1/2mm PVC banding on cabinet faces and upper and lower edge of wall cabinet end panels, machine applied with waterproof hot melt adhesive.
   2. 3mm PVC banding, machine applied with waterproof hot melt adhesive machine profiled to 1/8" radius for safety.
   3. 3mm banding to be used on external edges, outside edges of door and drawer fronts, and all exposed shelves.

2.02 FABRICATION

A. Fabricate millwork, countertops and related products to dimensions, profiles, and details shown.

B. Cabinet Body Construction:
   1. Tops and bottoms are joined to cabinet ends and internal cabinet components such as fixed horizontals, rails and verticals using 8mm diameter industrial grade hardwood dowels, laterally fluted with chamfered ends, securely glued and clamped under pressure during assembly to secure joints and cabinet squareness. A minimum of six (6) dowels at each joint for 24" deep cabinets and a minimum of four (4) dowels at each joint for 12" deep cabinets are used.
   2. Unless specifically indicated, core is ¾" thick particleboard. Edging and surface finishes as indicated herein.
   3. Cabinet backs are 3/4" thick melamine. Cabinets are provided with 1/4" x 4" dunnage mounting strip behind cabinet back to secure the cabinet to the wall. Exposed back on fixed or movable cabinets is ¾" particleboard with the exterior surface finished in GP28 laminate as selected.
   4. All fixed under counter and tall units have an individual factory applied base, constructed of ¾" A.C. Grade plywood. Base 96mm (nominal 4") high unless otherwise indicated on the drawings.
   5. All end panels and vertical dividers are prepared to receive adjustable shelf hardware at 32mm (approximately 1-¼") line boring centers. Door hinges, drawer slides and pull-out shelves mount in the line boring to assure consistent alignment of components.
   6. All exposed and semi-exposed edges of basic cabinet components are factory edged with PVC banding, machine applied with waterproof hot melt adhesive. Edging is 1/2mm PVC.
   7. Adjustable shelf core is ¾" thick particleboard up to 30" wide. Provide adjustable shelf holes in cabinet back over 30" wide. Front edge is factory applied 1/2mm PVC.
   8. A. Interior Finish/Units with Open Interiors: Sides, top, bottom, horizontal, and vertical members, and adjustable shelving faced with HPL laminate with matching prefinished back.
      B. Interior Finish/Units with Open Interiors: Janitor and Storage Units not in Open view: Sides, top, bottom, horizontal members, vertical members, and adjustable shelving faced with thermally fused melamine laminate with matching back.
   9. Interior Finish/Units with Closed Interiors: Sides, top, bottom, horizontal and vertical members, and adjustable shelving faced with thermally fused melamine laminate with matching back.
   10. Exposed Ends: Faced with high-pressure decorative laminate GP28 (.028) color from casework manufacturer's full range offering, from Wilsonart, Nevamar, Formica, standard grades and finish.
   11. Wall Unit Bottom: Faced with thermally fused melamine laminate.
   12. Wall and Tall Unit Tops: The top edge and bottom edge of all wall and tall unit end panels are factory edged with 1/2mm PVC. Top surface is laminated with thermally fused melamine laminate.
   13. Balanced construction of all laminated panels is mandatory. Unfinished core stock surfaces, even on concealed surfaces (excluding edges), will not be permitted. No exceptions.

C. Drawers:
   1. Backs and bottoms are 3/4" thermally fused melamine laminate. The back and bottom are attached to Metabox sides with 5mm screws. Top edge is banded with 1/2mm PVC.
   2. Painted finishes on drawer sides and/or bottom will not be permitted.

D. Door/Drawer Fronts:
   1. Core for all doors and applied drawer fronts is ¾" thick particle core. All edges at exposed shelving, doors and drawers are to be edged as indicated herein.
   2. Double doors are used on all cabinets in excess of 24" wide.
   3. Exterior faces are laminated with high-pressure decorative laminate GP28, color as selected. Interior face is thermally fused melamine laminate.
   4. All door/drawer edges are finished with 3mm PVC, machine applied with waterproof hot melt adhesive. External edges and outside corners are machine profiled to 1/8" radius.

E. Miscellaneous Shelving:
   1. Core material is 3/4" thermally fused melamine laminate.
   2. Exterior faced with high-pressure decorative laminate GP28 if in open view.
   3. Edges finished with 3mm PVC, machine applied with waterproof hot melt adhesive. External edges and outside corners are machine profiled to 1/8" radius.

2.03 DECORATIVE LAMINATE COUNTERTOPS

A. All nominal 1 – 1/4" thick laminate clad countertops shown on drawings are constructed with 1 – 1/8" particleboard core laminated top face with GP50 (.050) high-pressure decorative laminate, with BK20 backer underside. Provide tight joint fasteners where needed. All exposed edges, including edges with backsplash where used, have 3mm PVC banding, machine applied with waterproof hot melt adhesive. Exposed edges and corners are machine profiled to 1/8" radius for safety.

PART 3-EXECUTION

3.01 INSPECTION

A. The installer must examine the job site and the conditions under which the work under this section is to be performed, and notify the contractor in writing of unsatisfactory conditions.

B. Do not proceed with work under this section until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.02 PREPARATION

A. Condition millwork to average prevailing humidity conditions in installation areas prior to installing.

3.03 INSTALLATION

A. Install millwork with factory-trained supervision authorized by manufacturer. Erect casework plumb, level, true and straight with no distortions. Shim as required. Where laminate clad millwork abuts other work, scribe and cut to accurate fit.

B. Adjust millwork and hardware so that doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.04 CLEANING AND PROTECTION

A. Repair or remove and replace defective work as directed upon completion of installation.

B. Clean plastic surfaces, repair minor damage per plastic laminate manufacturer's recommendations. Replace other damaged parts or units.

C. Advise contractor of procedures and precautions for protection of casework and tops from damage by other trades until acceptance of the work by the owner.

END OF SECTION

SECTION 06 4117
CABINET HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Door and drawer pulls, door hinges, adjustable shelf hardware, locks, and all miscellaneous cabinet hardware.

1.02 RELATED SECTIONS

A. Section 06 4116, Laminate Clad Millwork and Related Products.

1.03 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each specified product; include recommended installation accessories for project conditions.

C. Samples: One item of each specified product; label items with manufacturer's name and model number of item.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Blum

B. Hafele

C. National Lock

D. Knape and Vogt

2.02 MATERIALS

A. Hinges: Five knuckle, institutional grade, 2-¾" overlay type with hospital tip. Steel is minimum.095" thick and has a minimum of nine (9) edge and leaf fastenings and epoxy coated finish. Hinges pass ANSI-BHMA standard A 156.9, Grade 1 requirement for both vertical and horizontal set and sag (pair of hinges will hold minimum of 310 pounds); copy of test result provided upon request. Hinges are secured with specifically engineered screws. Doors 48" and over in height have three (3) hinges per door. Magnetic door catch with minimum five (5) pound pull provided, attached with screws and slotted for adjustment.

B. Pulls: Door and drawer front pulls are epoxy powder coated metal wire style, 4 inch spacing on fasteners. Pull design is compatible with the Americans with Disability Act (ADA), Federal Register Volume 567, No. 144, specifically paragraph 4.27.4.

C. Drawer Slides:
   1. Regular use and knee space drawers are Blum Style Metabox 320 Metal Drawer System and are epoxy powder coated. Slides have a 100-pound load rating at full extension and a built-in, positive stop both directions, with self-closing feature.
   2. File drawer slides are full extension Blum Style Metabox 330 Metal Drawer System, and are epoxy powder coated with Metafile Rails.
   3. Slides have a lifetime warranty as offered by the slide manufacturer.

D. Adjustable Shelf Supports: Injection molded polycarbonate, clear color to blend with selected interior finish, friction fit into cabinet end panels and vertical dividers, readily adjustable on 32mm (approximately 1-¼") centers. Each shelf support has two (2) integral support pins, 5mm diameter, to interface pre-drilled holes, and to prevent accidental rotation of support. The supports automatically adapt to ¾" or 1" thick shelving and provide non-tip feature for shelving. Supports are designed to readily permit field fixing of shelf if desired. Structural load tests shall show loading to 1,040 pounds (260 pounds per support) without failure.

E. Locks:
   1. For doors and drawers as shown on drawings are National Lock #M4-7054C, removable core, disc tumbler, cam style lock with strike. Each lock is furnished with two (2) keys. Lock for sliding 3/4" doors is a disc type plunger lock, sliding door type with strike.
   2. Each door and drawer is to be provided with a lock.
   3. Key each room differently.

F. Metafile File Suspension Rails: All file drawers include a pair of 14-gauge steel Metafile file suspension rails, epoxy powder coated. File followers, or other split bottom hardware, are not acceptable.

G. Steel Workstation and Counter top Brackets:
   1. 2.0" concealed brackets.
   2. Support Armlength: As indicated on drawings.
   3. Finish: Black 909-58.
   4. Equal to steel brackets as manufactured by A&M Hardware, Inc.

H. Grommet:
   1. 2 ½" Dia. Grommet.
   2. Equal to "EDPCGI" Clipper Gripper Liner by Mockett; Doug Mockett & Company, Inc.

PART 3—EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 06 6116
SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Solid Surface
   1. Counter Top
   2. Changing Station
   3. Window Sills

1.02 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. National Electrical Manufacturers Association (NEMA)

D. Federal Specifications (FS)

1.03 SUBMITTALS

A. Samples: Submit minimum 2" x 2" (50mm x 50mm) samples. Indicate full range of color and pattern variation. Approved samples will be retained as standards for work.

B. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.

C. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project close-out documents.

1.04 QUALITY ASSURANCE

A. Allowable tolerances:
   1. Variation in component size: + 1/8" (3mm).
   2. Location of openings: + 1/8" (3mm) from indicated location.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.06 WARRANTY

A. Provide manufacturer's 10 year warranty against defects in materials. Warranty shall provide material and labor to repair or replace defective materials. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. LG Hausys American; www.lghausys.com

B. Corian, DuPont Company, Wilmington, Delaware

C. Surell, Formica; www.Formica.com

2.02 MATERIALS

A. Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.

B. Thickness: ½ inch

C. Color: To be selected.

D. Product equal to: Aronite Surface – Studio Collection – Price Group "G"; gloss finish.

2.03 ACCESSORIES

A. Joint adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with a chemical bond.

B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL® recognized silicone sealant in color-matching or clear formulations.

2.04 FABRICATION - COUNTER TOPS

A. 1/2" thick solid polymer material, adhesively joined with inconspicuous seams.

B. Edge: Eased smooth edges.

C. Finish: as selected by Architect.

D. Solid Polymer top over 3/4" plywood.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.

B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

C. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Components shall be clean on Date of Substantial Completion.

D. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction and invoice for the cost of repairs. Architect to pre-approve cost estimate before repairs are made.

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 1113
BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Bituminous Damp proofing:
   1. Block walls behind masonry veneer at exterior.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast In Place Concrete

B. Section 04 2000 – Unity Masonry

1.03 REFERENCE STANDARDS

A. ASTM D 1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 1995 (Reapproved 2000).

B. ASTM D 2822 - Standard Specification for Asphalt Roof Cement; 1991 (Reapproved 1997).

C. NRCA ML104 - The NRCA Roofing and Waterproofing; National Roofing Contractors Association; Fifth Edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum two years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until damp proofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sonneborn Waterproofing Systems; Product Sonoshield, Hydrocide 700.

2.02 COLD ASPHALTIC MATERIALS

A. Bitumen: Emulsified asphalt, ASTM D 1227; with fiber reinforcement other than asbestos (Type II).
   1. Comply with ASTM D1227-95, Type 2, Class 1.
   2. 52% solids by volume
   3. 54% solids by weight
   4. Viscosity: Penetrometer, 325-335
   5. Coverage: 1/16" wet film: 25 sq. ft per gallon

B. Asphalt Primer: ASTM D 41, compatible with substrate.

C. Sealing Mastic: Asphalt roof cement, ASTM D 2822, Type I.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of damp proofing system.

C. Verify items which penetrate surfaces to receive damp proofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive damp proofing.

B. Clean and prepare surfaces to receive damp proofing in accordance with manufacturer's instructions.
   1. Surface to be free of oil, grease, dirt, laitance and loose material.

C. Do not apply damp proofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.03 APPLICATION

A. Prime surfaces in accordance with manufacturer's instructions, if required.

B. Apply bitumen in one coat, continuous and uniform, at a rate of one gal/25 sq. ft.

C. Seal items projecting through damp proofing surface with mastic. Seal watertight.

END OF SECTION

SECTION 07 1900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior masonry surfaces.
   1. All exterior masonry veneer.
   2. Precast Architectural Concrete.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry

B. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ASTM D 5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes, and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2002).

B. ASTM D3278 - Standard Test Methods for Flash Point of Liquids.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide product description.

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 the work of this section with minimum 3 years experience.

1.06 MOCK-UP

A. Prepare a representative surface 48 x 48 inch in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. Locate where directed.

C. Mockup may remain as part of the Work.

1.07 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F or higher than 100 degrees F.

1.08 WARRANTY

A. Installer's two year guarantee against defects, water penetrations, efflorescence, discoloring, etc.

B. Manufacturer's ten year non-prorated labor and materials warranty for moisture penetration.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Water Repellents:
   1. "Weather Seal Siloxane WB" as manufactured by Prosoco, Inc., Kansas City, Kansas.
   2. "Enviroseal Clear Double 7" as manufactured by Hydrozo, Inc.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Vertical surfaces and non-traffic horizontal surfaces.

B. Water Repellent: Solvent-free blend of silanes and oligomeric alkoxysiloxanes.
   1. Form: Clear amber liquid.
   2. Specific Gravity: .96
   3. Active Content: 100%
   4. pH: Not applicable.
   5. Weight/Gallon: 7.9 lbs.
   6. Flash Point: 69 degrees F (21 degrees C) concentrate ASTM D 3278
      a. 140 degrees F (60 degrees C) in 1:9 dilution
      b. 145 degrees F (62 degrees C) in 1:14 dilution
   7. Freeze Point: < -22 degrees F (<-30 degrees C)
   8. VOC Content: Complies with national, state, and district AIM VOC regulations at recommended dilutions. Low VOC per ASTM D5095.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

B. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

C. Remove loose particles and foreign matter.

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended for best results.
   1. Follow manufacturer's recommended dilution ratios.

B. Vertical Application Instructions
   1. For best results, apply diluted protective treatment "wet-on-wet" to a visibly dry and absorbent surface.
   2. Alternate application methods.
      a. Spray: Saturate from the bottom up, creating a 4" to 8" (15 to 20 cm) rundown below the spray contact point. Let the first application penetrate for 2-3 minutes. Resaturate. Less material will be needed for the second application.
      b. Brush or Roller: Saturate Uniformly. Let diluted protective treatment penetrate for 2 to 3 minutes. Brush out heavy runs and drips that do not penetrate.

C. Product must be applied within 24 hours of dilution for maximum effectiveness.
   1. Product should be applied within 8 hours of dilution.

3.04 PROTECTION OF ADJACENT WORK

A. Protect adjacent landscaping, property, and vehicles from drips and overspray.

B. Protect adjacent surfaces not intended to receive water repellent.

C. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION

SECTION 07 2113
BOARD INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board Insulation:
   1. Perimeter foundation wall.
   2. Exterior wall cavity.
   3. Concrete slab and ramp formwork

1.02 RELATED SECTIONS

A. Section 03 3000 – Cast-in-Place Concrete

B. Section 04 2000 - Unit Masonry

1.03 REFERENCES

A. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties.

B. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2004a.

C. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. "Formular CW 15" as manufactured by Owens Corning.

B. "CM" insulation board as manufactured by Green Guard, Pactive Building Products

C. Styrofoam, "Cavity Mate" as manufactured by Dow Chemical Company.

2.02 BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: ASTM C 578, Type X; Extruded polystyrene board with either natural skin or cut cell surfaces; with the following characteristics:
   1. Board Size: 48 x 96 inch and 16 x 96 inch.
   2. Board Thickness: 1 ½ inch; see drawings.
   4. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
   5. Thermal Resistance: R-value, R-5.0 per inch; ASTM C 518.
   6. Compressive Resistance: 15 psi.
   7. Board Density: 1.3 lb/cu ft.
   8. Water Absorption, maximum: 0.3 percent volume.
   9. Surface Burning Characteristics: Flame spread/Smoke developed index of 5/165, when tested in accordance with ASTM E 84.

B. Adhesive: Type recommended by insulation manufacturer for application.
   1. Sonneborn 200 Adhesive

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 and adhesive.

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 and exterior cavity.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT CAVITY WALLS

A Apply adhesive to back of boards.

   1. Three continuous beads per board length

B. Install boards to fit snugly between wall ties.

C. Install boards horizontally on walls.

   1. Place boards to maximize adhesive contact.

   2. Install in running bond pattern.

   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION FOR CONCRETE FORMWORK

A. Install boards to fit snugly between side formwork.

B. Cut to fit insulation tightly. Secure insulation prior to placement of concrete to ensure that board forms do not shift.

C. Install where indicated on structural drawings.

3.05 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2116
BLANKET INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall construction where detailed.

B. Batt insulation at interior partitions.

C. Miscellaneous batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof, behind structure at exterior walls.

1.02 RELATED SECTIONS

A. Section 05 4000 - Cold-Formed Metal Framing

B. Section 09 2116 – Gypsum Board Assemblies

1.03 REFERENCES

A. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2001.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

C. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2004.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Owens Corning, Toledo, Ohio

B. Johns Manville, Denver, Colorado

C. Certain Teed Corporation, Valley Forge, Pennsylvania

2.02 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Surface Burning Characteristics: Flame spread index of 25 or less; smoke developed index of 450 or less, when tested in accordance with ASTM E 84.
   2. Combustibility: Non-combustible when tested in accordance with ASTM E 136, except for facing, if any.
   3. Provide insulation made without formaldehyde.
   4. Thermal Resistance: See 3.03 Schedules.
   5. Thickness: See 3.03 Schedules.
   6. Facing: Unfaced.
      a. ASTM C 665; Federal Specification HH-1-521F, Type I.
   7. Facing: Kraft faced, one side.
      a. ASTM C 665; Federal Specification HH-1-521F, Type II.
   8. Facing: Foil faced, one side.
      a. ASTM E84:
         1.) Maximum flame spread index: 25
         2.) Maximum smoke development index: 50

PART 3 EXECUTION

3.01 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall 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.

E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Secure facing flanges in place at maximum 6 inches on center.

G. Tape seal all butt ends, lapped flanges, and tears or cuts in membrane.

H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.02 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

3.03 SCHEDULES

A. Exterior Walls:
   1. Kraft Faced
      a. 6-1/4 inch thick, R-Value R-19.
      b. 8-1/4 inch thick, R-Value R-30
   2. Foil Faced
      a. 6-1/4 inch thick, R-Value R-19.
      b. 8-1/4 inch thick, R-Value R-30
      c. Install foil faced insulation when exposed on exterior walls and concealed locations.

B. Interior Walls:
   1. 3-1/2", 6-1/4", and 8" thick, un-faced

END OF SECTION

SECTION 07 2501
WEATHER RESISTANT MEMBRANES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Weather resistant membranes for light commercial buildings (Building Wrap).

1.02 RELATED SECTIONS

A. Section 06 1000 - Rough Carpentry

B. Section 06 1636 – Wood Panel Product Sheathing

C. Section 09 2116 – Gypsum Board Assemblies

1.03 REFERENCES

A. AATCC Test Method 127 – Water Resistance: Hydrostatic Pressure test; 1998.

B. ASTM E 96 – Standard Test Methods for Water Vapor Transmission of Materials; 2000

C. ASTM E 1677 – Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls; 1995 (Reapproved 2000).

1.04 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Test Results: Submit copies of test results showing performance characteristics equaling or exceeding those specified.

C. Submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers:
   1. "Tyvek", "Commercialwrap". Dupont Company, Wilmington, DE.
   2. "Ultra Wrap", Green Guard, Atlanta, GA.

B. Provide all weather resistant membranes from a single manufacturer, and shall include the work under Section 07 2726 – Fluid Applied Weather Barrier System.

2.02 MATERIALS

A. Tyvek® Water Resistant Barrier: Spunbonded olefin, nonwoven, non-perforated:
   1. Classification: ASTM E 1677, Type I, air leakage of 25 mph wind pressure less than 0.06 cubic feet per minute per square foot..
   2. Water Vapor Transmission: Greater than 20 perms, when tested in accordance with ASTM E 96 Procedure B.
   3. Water Penetration Resistance: Minimum 78.7 inches per AATCC Test Method 127.

B. Sealing Tape: DuPont Contractor Tape.

C. Fasteners:
   1. Steel Framing: Rust-resistant screws with washers.

D. Flashing Tape: Dupont Tyvek "Flexwrap" or "Straight Flash".

PART 3 EXECUTION

3.01 INSTALLATION

A. Install weather resistant membranes in accordance with manufacturer's instructions over exterior sheathing.
   1. Create a complete wall wrap system.

B. Seal joints and penetrations through weather resistant membranes with tape and fasteners before installation of finish material.

C. Ensure that weather resistant membranes are air tight, free from holes, tears, and punctures.

D. Tape all window and door penetrations in accordance with manufacturer's instructions.
   1. Use "Flexwrap" per manufacturer's instructions; odd or custom shapes.
   2. Use "Straightflash" per manufacturer's instructions; square shapes.

END OF SECTION

SECTION 07 2600
VAPOR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor barriers under concrete floor slabs on grade.
   1. All Interior floor slabs.

B. Tape to seal joints and repair vapor barrier.

C. Accessories.

1.02 RELATED SECTIONS

A. Section 03 3000 - Cast-in-Place Concrete: Slabs on grade.

1.03 REFERENCES

A. ASTM D 882 - Tensile Properties of Thin Plastic Sheeting; 2002.

B. ASTM D 1709 - Standard Specification for Impact Resistance of Plastic Film by the Free-Falling Dart Method; 2004.

C. ASTM E 96 - Water Vapor Transmission of Materials; 2000.

D. ASTM E 1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete slabs; 1998.

E. ASTM E 1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under concrete slabs; 1997 (Reapproved 2004).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:
   1. Store products in manufacturer's unopened packaging until ready for installation.
   2. Store materials in a clean, dry area in accordance with manufacturer's instructions.

C. Handling: Protect materials during handling and installation to prevent damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Stego Wrap (15 mil) Vapor Barrier by Stego Industries LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com.

B. Griffolyn T-85 by Reef Industries

2.02 VAPOR RETARDERS - UNDER CONCRETE SLABS

A. Polyolefin Geomembrane
   1. Water Vapor Barrier: ASTM E 1745; meets or exceeds Class A.
   2. Thickness: 15 mil
   3. Water Vapor Permeance: 0.01 or less perms when tested in accordance with ASTM E 96.
   4. Tensile Strength: 79.6 lbf./in. when tested in accordance with ASTM D 882.
   5. Puncture Resistance: 2326 grams when tested in accordance with ASTM D 1709.

2.04 ACCESSORIES

A. General: Accessories are to be from same manufacturer as reinforced vapor barriers.

B. Self-Adhesive Repair Tape: High density polyethylene tape with pressure sensitive adhesive, 4 inches wide; under slab membrane only.

C. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions; under slab membrane only.

D. Mastic: Stego Mastic

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine surfaces and areas to receive reinforced vapor barriers. Notify Architect in writing defects of work and other unsatisfactory site condition that would cause defective installation of vapor retarders. Do not begin installation until unacceptable conditions have been corrected.

B. Verify site dimensions.

C. Commencement of work will imply acceptance of substrate.

3.02 INSTALLATION - UNDER CONCRETE SLABS

A. Install vapor barriers in accordance with manufacturer's instructions and ASTM E 1643 at concrete slabs.

B. Install vapor barriers continuously at locations as indicated on the drawings. Ensure there are no discontinuities in vapor barrier at seams and penetrations.

C. Install vapor barriers in largest practical widths.

D. Ensure surface beneath vapor barrier is smooth with no sharp projections.

E. Join sections of vapor barrier and seal penetrations in vapor barrier with mastic tape.

F. Insure vapor barrier surfaces to receive mastic tape are clean and dry.

G. Immediately repair holes in vapor barrier with self-adhesive repair tape.

H. Seal around pipes and other penetrations in vapor barrier with pipe boots in accordance with manufacturer's instructions.

3.03 PROTECTION

A. Protect vapor retarders from damage during installation of reinforcing steel and utilities and during placement of granular materials or concrete slab.

B. Immediately repair damaged vapor barrier in accordance with manufacturer's instructions.

3.04 SCHEDULES

A. Under all concrete slabs:
   1. STEGO Wrap, 15 mil vapor barrier.

END OF SECTION

SECTION 07 4200
METAL WALL AND SOFFIT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured metal panels for exterior walls, and soffit panels, with related flashings; and accessory components.

B. Interior metal wall panels.

1.02 RELATED REQUIREMENTS

A. Section 05 1000 – Rough Carpentry

B. Section 06 1636 – Wood Panel Product Sheathing

C. Section 07 2501 – Weather Resistant Membranes

D. Section 07 9005 - Joint Sealers

1.03 REFERENCE STANDARDS

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2009a.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.

C. Samples: Submit two samples of each wall panel; 24 inch by 24 inch in size illustrating finish color, sheen, and texture.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty year manufacturer warranty on material including degradation of material finish.

C. Correct defective work within a twenty year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

D. Correct defective Work within a two year period after Substantial Completion, including defects in water tightness and integrity of seals and fasteners.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Holcim, Elevate Building Products, Nashville, TN.

B. Morin, A Kingspan Group Company, Bristol, CT.

C. Metal Sales Manufacturing, Corporation, New Albany, Indiana.

D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS

A. Panel 1: Exterior Wall Panel (Vertical)
   1. Equal to Elevate "Omega HR" metal wall panel.
   2. 36 inch wide panel; 1-1/4 inch deep panel.
   3. 45 degree, corrugated trapezoidal profile, with ribs at 12 inches on center.
   4. 24 gauge panel thickness.
   5. Kynar 500 finish.
   6. Color: Selected from standard manufacturer's colors.
   7. Exposed fasteners.

B. Exterior Metal Soffits
   1. Equal to Elevate "UC-500" metal wall panel.
   2. 12 inch wide panels; 1 inch deep panel.
   3. Smooth, flush panels.
   4. 22 gauge panel thickness.
   5. Kynar 500 finish.
   6. Color: Selected from standard manufacturer's colors.
      Note: Color other than white will be required.
   7. Concealed fasteners.

C. Internal and External Corners: Same material, thickness, and finish as panels; profile to suit system; brake formed to required angles.

D. Expansion joints: Same material, thickness and finish as exterior sheets.

E. Trim: Closure Pieces; Caps; Flashings; Facias; Infills: Same material, thickness and finish as panels; brake formed to required profiles.

2.03 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M Structural Steel with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

B. Exterior Finish Coating: Panel manufacturer's standard Kynar 500 finish.

C. Panel Back Coating: Panel manufacturer's standard polyester.

2.04 ACCESSORIES

A. Sealants: As specified in Section 07 9005.

B. Fasteners: Manufacturer's standard type to suit application.

C. Field Touch-up Paint: As recommended by panel manufacturer.

2.05 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practicable lengths.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

3.02 INSTALLATION

A. Install panels on walls, soffits, and liner panels in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports. Lap panel ends minimum 2 inches (50 mm).

E. Provide expansion joints where indicated.

F. Use concealed fasteners unless otherwise approved by Architect.

G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES

A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.

B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 6100
SHEET METAL ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished galvanized sheet steel roofing.

B. Flashings and trim.

C. Integral fascias.

1.02 RELATED REQUIREMENTS

A. Section 07 2116 – Blanket Insulation.

B. Section 07 6200 - Sheet Metal Flashing and Trim.

C. Section 07 7123 – Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2004a.

C. ASTM E 283 - Standard Test Method for Determining Air Leakage.

D. ASTM E 331 - Standard Test Method for Water Penetration

E. UL 580 and UL 90 - Test for Wind-Uplift Resistance of Roof Assemblies.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Product Data: Provide data on metal types, finishes, characteristics.

D. Submit two samples 4 x 4 inch in size illustrating metal finish color.

E. Provide certification letter that roofing product meets or exceeds the EPA's Energy Star Requirements.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise noted.

B. Manufacturer's Qualifications:

1. The manufacturer has been regularly engaged in the fabrication of metal standing seam roof systems for at least ten (10) years and is an American Owned Company, regardless of name change. A brief list of similar projects shall be submitted with the shop drawings.
2. The manufacturer maintains a CERTIFIED installer program for its products and maintains an up-to-date authorized roofing contractor list.
3. The manufacturer has a written warranty covering durability, color and weather tightness of its roof system. Sample warranties shall be provided to the architect prior to contract award.
4. Manufacturer shall be recognized as: A manufacturer that will provide fixed equipment, operated by manufacturer employee and not a portable on site roll former. Portable roll forming may be utilized only for radius materials. All standing seam panels shall be run on fixed equipment utilizing tension stabilization. Liability of finished product shall fall to single

source manufacturer. Manufacturer shall be capable of producing panel lengths of 45 feet or longer.

5. Manufacturer shall maintain a dedicated staff of engineers, estimators and designers. Engineers and estimators are identified as roofing specialists, providing design, engineering services as full time employees of the manufacturer.
6. Manufacturer shall be identified as a provider of standing seam metal products, have sales in excess of 25 million dollars annually and provide proof of financial strengths against warranty liabilities.

C. Installer Qualifications: Company specializing in performing sheet metal roof installations with minimum 3 years of experience.

1. Installation of the standing seam metal roofing panel and roof related accessories shall be performed by roofers, PREFERRED & AUTHORIZED by the manufacturer as trained and qualified to erect the manufacturer's product.
2. Roofing contractor must submit, as part of the submittal package, a letter from the manufacturer of the standing seam metal roofing system, certifying the date of authorization to install, from the manufacturer.
3. Maintain a minimum of $1,000,000 general liability coverage for each loss.
4. Maintain sufficient worker's compensation coverage as mandated by law.
5. Have no viable claims pending, regarding negligent acts, defective workmanship on previously performed or current projects.
6. Have not filed for protection from creditors under any state or federal insolvency or debtor relief statues or codes.
7. Have installed five (5) projects of similar scope and magnitude that have been in service for minimum of 2 years with satisfactory performance of the entire roof system.
8. Installer must execute 100% of roof system installation, utilizing employees that are confirmed as full time employees of the contractor. Second and third tier sub-contractors for the installation of work in this section shall not be permitted.
9. Installer shall be identified as "primary source of business" for standing seam metal roof systems.

1.06 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver metal roofing to job site packaged to provide protection against transportation damages.

B. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Store under water-proof covering.

D. Prevent contact with materials which may cause discoloration or staining.

E. Provide ventilation to prevent condensation build-up between each panel or trim/flashing component.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide twenty year manufacturer warranty for weather tightness. Warranty shall include degradation of metal finish.

C. Warranty is to include all flashings, trim, roof curbs, gutters, and other roof components.

D. Installer Warranty: Provide two year contractor warranty on materials and workmanship.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Performance Requirements: Provide sheet metal roofing which has been manufactured, fabricated and installed to withstand structural and thermal movement, wind loading and

weather exposure to maintain manufacturer's performance criteria without defects, damage, failure of infiltration of water.

1. Wind-Uplift: Roof panel assembly shall comply with UL 580 for UL 90 rated assemblies.
2. Static Air Infiltration: Completed roof system shall have a maximum of.06 cfm/sf with 6.24 kPa air pressure differential as per ASTM E283.
3. Water Infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 7.24 psf (43 kPa) and not more than 12.0 psf (83 kPa) as per ASTM E331.

B. Design Criteria:
   1. The following standards and criteria shall be used where covered by this specification:
      a. Manual of Steel Construction, American Institute of Steel Construction - current Edition;
      b. Cold Formed Steel Design Manual, American Iron and Steel Institute 1996 Edition.
      c. Low Rise Metal Building Systems Manual, American Iron and Steel Institute - 1996 Edition.

2.02 SHEET MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A 653/A 653M, with G90/Z275 zinc coating; 24 gage core steel, shop pre-coated with Kynar 500 coating; color as selected.
   1. Minimum Yield Stress: 50 ksi
   2. 2" high vertical seam
   3. 16"-18" Wide Panels.
   4. Standing seam roof system

2.03 MANUFACTURERS

A. Elevate Metal Products; UNA-CLAD, Double-Lock, "UC-6".

B. MBCI; Batten, "HS"

C. AMS: Lock-Seam

D. See Section 01 6000 - Product Requirements, for substitution procedures.

2.04 ACCESSORIES

A. Fasteners: Non-corrosive, per manufacturer's recommendation to meet UL-90 rated assemblies.

B. Roof Penetrations:
   1. All pipe penetrations through roof are to be flashed with EPDM rubber sized to pipe with ductile aluminum reinforcing ring bonded to rubber flange on base of flashing units equal to those manufactured by “Dektite”. Acceptable substitutes are “Willard”, “Mayco”, and “Neverleak”.

C. Trim and Flashings:
   1. Trim and Flashings: Fabricate trim and flashings from same material as roof system material.
   2. Trim and flashings are a part of the roofing warranty.

D. Clips: Manufacturer's standard clips for concealed securement of panels. Clips must accommodate for movement of panels.

E. Seam: To have factory applied sealant.

F. Source Quality: All materials are to be from a single manufacturer.

G. Sealant: Permanently elastic, non-sagging, non-toxic, non-staining tape sealant approved by the panel manufacturer.

2.05 FABRICATION - ROOFING

A. Metal Roof System:

1. Fabricate metal roof system with vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations. Seams to have factory applied sealant and are to be locked together by an electrically powered mechanical seaming device during installation.
2. Panels are to be 16-18 inches wide 2" high ribs.

B. Form sections true to shape, accurate in size, square, and free from distortion or defects.

C. Fabricate starter strips, interlockable with sheet.

D. Form pieces in longest practical lengths.
1. End laps must be approved by architect.

E. Hem exposed edges on underside 1/2 inch; miter and seam corners.

F. Form material with standing seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

2.06 FACTORY FINISHING

A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; as selected from manufacturer's standard colors.
1. Finish to consist of 70% Kynar 500.

B. Color
1. To be selected from manufacturers standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is ready to receive roofing.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION - ROOFING

A. Comply with manufacturer's product data, recommendations, and installation instructions.

3.04 INSTALLATION - STANDING SEAM ROOFING

A. Conform to SMACNA Architectural Sheet Metal Manual details.

B. Space standing seams at 16 inch on center.

C. Install clips with screws extending into structural metal decking per manufacturer's instructions.

D. Lay sheets with long dimension perpendicular to eaves. Apply pans beginning at eaves.

E. Lock cleats into seams and flatten.

F. Stagger transverse joints of roofing sheets; end laps allowed only with approval of architect.

G. At eaves and gable ends, terminate roofing by hooking over edge strip.

H. Make first fold 1/4 inch wide single fold and second fold 1/2 inch wide, providing locked portion of standing seam, 5 plies in thickness.

I. Seams to be machine seamed with motorized seamer.

3.05 INSTALLATION - FLASHINGS

A. Conform to SMACNA Architectural Sheet Metal Manual.

B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

C. Cleat and seam all joints.

D. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

3.06 PROTECTION

A. Do not permit traffic over unprotected roof surface.

END OF SECTION

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and miscellaneous flashing.

1.02 RELATED REQUIREMENTS

A. Section 07 6100 – Sheet Metal Roofing

B. Section 07 6500 - Through-wall flashings in masonry

C. Section 07 7123 – Manufactured Gutters and Downspouts

D. Section 07 9005 - Joint Sealers

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;2009a

B. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.

1.05 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 which may cause discoloration or staining.

1.06 WARRANTY

A. All sheet metal flashing and trim that is a part of the roofing system is a part of the roof weather-tightness warranty for each type of roofing.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 24 gauge thick base metal, shop pre-coated with Kynar 500 coating.

B. Same material as sheet metal roofing.

2.02 ACCESSORIES

A. Fasteners: Lapped and riveted.

B. Provide all accessories essential to completeness of installation.

C. Sealant: Type as specified in Section 07 9005.

D. Provide all clips and concealed fasteners at coping system to make complete installation.

E. Termination bars: as indicated on drawings.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Metal flashings shall lap a minimum of 6 inches each joint and shall lap over a bead or brushing of non-setting caulking compound and be riveted.

D. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

E. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

F. See details on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

B. Seal metal joints watertight.

C. Install metal reglet and flashing system per manufacturer's recommendations with manufacturer approved fasteners.

END OF SECTION

SECTION 07 6500
FLEXIBLE FLASHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Laminated metal flashings and counter flashings.
   1. Through wall flashing at existing and new masonry

1.02 RELATED SECTIONS

A. Section 04 2000 - Unit Masonry.

1.03 REFERENCES

A. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data sheets showing product characteristics and including installation instructions.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company with at least five years of successful experience in weathertight installation of flashing.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's sealed containers and packaging, bearing manufacturer's name and product identification.

B. Stack flashing materials to avoid twisting, bending, and abrasion. Protect materials from weather before installation.

C. Store mastic materials in sealed containers under cover.

1.07 WARRANTY

A. To be warranted to be free of defects in manufacture for five (5) years. Material will be provided at no charge to replace any defective product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Sandell Manufacturing Company, Inc; 310 Wayto Rd., Schenectady, NY 12303. ASD. Tel: (518) 357-9757. Fax: (518) 357 9636.

2.02 MATERIALS

A. Flexible Flashing: Copper fabric flashing; laminated sheet comprised of copper sheet, asphalt mastic coated on both sides, bonded under pressure between two layers of asphalt saturated, woven glass fabric.
   1. Copper weight: 5 oz/sq ft.
   2. Size: 18" x 25'-0" or 36" x 25'-0"; as required per application.

B. Mastic: Cut-back asphalt containing long fibered material, in trowel grade consistency.
   1. Sandell's Trowel Mastic

2.03 ACCESSORIES

A. Termination Bar:
   1. Provide metal termination bar at top of flashing at attachment of flexible flashing to sheathing.

2.04 FABRICATION

A. Forming: Fabricate flashings true to shape and accurate in dimension. Form pieces in longest possible lengths to minimize joints. Fold flashing at corners and at ends of pans instead of cutting.

B. Joints: Provide not less than 4 inches of overlap at flashing joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to receive flashing are thoroughly dry, free from loose materials, and reasonably smooth, with no sharp edges or projections.

3.02 INSTALLATION

A. General: Comply with recommendations of SMACNA Architectural Sheet Metal Manual.
   1. Lap joints minimum of 4 inches and seal watertight with mastic.
   2. Carry flashing vertically as detailed, but not less than 8 inches above horizontal plane
   3. Extend head and sill flashings not less than 6 inches beyond edges of openings and turn up to form watertight pan; seal with mastic.

B. Coordination: Interface flashing work with adjacent and adjoining work to ensure best possible weather resistance and durability of completed flashing.

C. Masonry Flashing: Comply with requirements of sections where masonry installation is specified.

D. Masonry Flashing: Lay horizontal flashing in slurry of fresh mortar and top with fresh full bed of mortar to receive masonry units. At vertical surfaces, spot flashing with mastic to hold in place until masonry has set.
   1. Carry flashing through wall and leave exposed for inspection.
   2. After inspection, cut flashing flush with surface of masonry.
   3. Remove mortar or other obstructions from weep holes at flashing locations.
   4. Flashing around corners to be continuous.
   5. Spandrel and Shelf Angles: Entire faces to be flashed.
   6. Sills: Place through wall flashing under all sills and from end dam at all terminations to form a continuous water deterrent seal.
   7. Flashing at Vertical Supports: When application requires puncturing or slitting, make sure all openings in the flashing are tightly sealed and that that flashing is terminated onto the supports with mastic.
   8. Weep Holes: In order to properly drain any water collected from properly applied flashing, weep holes must be provided immediately above the flashing at all flashing locations. In general, weep holes should be ¼" diameter, and should be spaced no further than 24" horizontally.
   9. Cleaning of all Excess Mortar: It is also necessary to clean out all excess mortar that may have dropped onto the flashing to ensure clear passage way for water to drain off flashing to the weep holes and out the exterior of the wall.

E. Installing Flashing: Thru wall flashing membrane is installed at locations requiring flashing to channel water out of cavity wall system through weep holes. If exterior drip edge is required terminate flashing 1" on stainless drip edge. Thru Wall Flashing is installed on base of walls, spandrel beams, ledges, window and door headers and other penetrations/interruptions of wall system. Use of drip edge is strongly recommended where flashing is being installed over a bridge course (to avoid efflorescence) or over concrete masonry (to avoid leaving CMU's holes exposed).

END OF SECTION

SECTION 07 7123

MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished metal gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 07 6100 – Sheet Metal Roofing.

B. Section 07 6200 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2005.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

D. CDA A4050 - Copper in Architecture - Handbook; Copper Development Association, Inc.; current edition.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

1.04 DESIGN REQUIREMENTS

A. Conform to SMACNA Architectural Sheet Metal Manual for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Conform to applicable code for size and method of rain water discharge.

C. Maintain one copy of each document on site.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

C. Product Data: Provide data on prefabricated components.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Metal gutters and downspouts to be same material as used for standing seam metal roofing and metal flashings. See Sections 07 6100 and 07 6200.

2.02 COMPONENTS

A. Gutters: CDA rectangular style profile.

B. Downspouts: CDA Rectangular profile. 6"x4".

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with CDA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets; minimum three (3) per downspout.

2.03 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

2.04 FACTORY FINISHING

A. Factory finished, Kynar 500

B. Color to be selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Sheet Metal: Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.

END OF SECTION

SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing.

B. Precompressed foam sealers.

C. Hollow gaskets.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C 510 - Standard Test Method for Staining and Color Change of Single or Multicomponent Joint Sealers

B. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cuclick Movement (Hockman Cycle).

C. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

D. ASTM C834 - Standard Specification for Latex Sealants; 2010.

E. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2002.

F. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2005.

G. ASTM D 1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2000.

H. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam); 1997.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal requirements.

B. Product Data: Provide data indicating sealant chemical characteristics.

C. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1. Install only when atmosphere temperature or joint surface temperature is above 40 degrees F.

1.07 COORDINATION

A. Coordinate the work with all sections referencing this section.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a three year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sealants
   1. Tremco, Sealant/Weatherproofing Division, Beachwood, Ohio. www.tremcosealants.com
   2. Dow Corning Corporation, Midland, Michigan
   3. Degussa Building Systems/Sonneborn; www.chemrex.com
   4. Bostik, Inc.; www.bostik-us.com
   5. Pecora Corporation; www.pecora.com

2.02 SEALANTS

A. Type A - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25, Uses M, G, and A; single component.
   1. Color: Standard colors matching finished surfaces.
   2. Product: Vulkem manufactured by Tremco.
   3. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Joints between food service equipment and surrounding construction.

B. Type B - Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Product: Butyl Sealant manufactured by Tremco.
   2. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.

C. Type C - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Color: Standard colors matching finished surfaces.
   2. Product: Trademate manufactured by Dow Corning.

D. Type D – Plumbing Fixture/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
   1. Product: Tremsil 200 manufactured by Tremco.
   2. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.

E. Type E - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C920, Class 25, Uses T, I, M and A; single component.
   1. Color: Gray.
   2. Product: Sonolastic SL-1 manufactured by Sonneborn.
   3. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width; "Rescor" manufactured by W. R. Meadows.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Sealant System Backing: "Backer-Rod" as manufactured by W. R. Meadows.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter which might impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

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. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
   1. Width/depth ratio of 2:1.
   2. Neck dimension no greater than 1/3 of the joint width.
   3. Surface bond area on each side not less than 75 percent of joint width.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

H. Apply caulking compound with hand gun having proper sized nozzles to fit joints and with sufficient pressure to completely fill voids and joints.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

3.06 SCHEDULE

A. Control and Expansion Joints in Paving: Type E.

B. Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent Work: Type A.

C. Lap Joints in Exterior Sheet Metal Work: Type B.

D. Under Exterior Door Thresholds: Type B.

E. Interior Joints for Which No Other Sealant is Indicated: Type C; colors as selected.

F. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type D.

G. Any location not listed: According to manufacturer's recommendations.

END OF SECTION

DIVISION 08

OPENINGS

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated steel frames and doors.

B. Steel frames for wood doors.

C. Thermally insulated steel doors.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 09 9000 - Painting and Coating: Field painting.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.

B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames; 1999.

C. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.

D. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998.

E. ASTM C236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989 (Reapproved 1993).

F. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2011.

G. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.

H. DHI A115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; 2000 (ANSI/DHI A115 Series).

I. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1999.

J. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

K. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, 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 grade standard.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.

D. Include test documentation validating compliance with FEMA-361 and code requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store in accordance with NAAMM HMMA 840.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Doors and Frames:
   1. Ceco Door Products: www.cecodoor.com.
   2. Republic Builders Products: www.republicdoor.com.
   3. Steelcraft: www.steelcraft.com.
   4. Amweld Building Products, Garrettsville, Ohio.

2.02 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Accessibility: Comply with ANSI/ICC A117.1.
   2. Door Top Closures: Flush with top of faces and edges.
   3. Door Edge Profile: Beveled on both edges.
   4. Door Texture: Smooth faces.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   6. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   7. Finish: Factory primed, for field finishing.

2.03 STEEL DOORS

A. Exterior Doors Non-Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
      a. 18 gauge
      b. Thickness 1--3/4"
   2. Core: Polystyrene foam.
   3. Top Closures for Outswinging Doors: Flush with top of faces and edges.
   4. Provide styles as shown on the drawings.
   5. Texture: Smooth faces.
   6. Weatherstripping: Separate, see Section 08 7100.
   7. Finish: Factory primed, for field finishing.

2.04 STEEL FRAMES

A. General:
   1. Comply with the requirements of grade specified for corresponding door, except:
      a. ANSI A250.8 Level 2 Doors: 16 gauge frames
      b. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 2, 16 gauge
   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.

B. Exterior Door Frames: Face welded, seamless with joints filled.

C. Interior Door Frames, Non-Fire-Rated: Face welded type, seamless with joints filled.
   1. Finish: Factory primed, for field finishing.

2.05 ACCESSORY MATERIALS

A. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

B. 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.

C. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.06 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

3.02 PREPARATION

A. Coat inside of frames to be installed in exterior masonry with bituminous coating, prior to installation.

3.03 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.

B. In addition, install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

E. Coordinate installation of hardware.

F. Coordinate installation of glazing.

G. Coordinate installation of electrical connections to electrical hardware items.

3.04 ERECTION TOLERANCES

A. Clearances Between Door and Frame: As specified in ANSI A250.8.

B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; fire rated and non-rated.

B. Flush wood doors with lite.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 – Finish Carpentry

B. Section 08 1113 - Hollow Metal Doors and Frames.

C. Section 08 7100 - Door Hardware.

D. Section 09 9000 – Painting and Coating: Site Finishing of Doors.

1.03 REFERENCES

A. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2003.

B. ICC (IBC) - International Building Code, 2012.

C. WDMA NWWDA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association (formerly NWWDA); 2004.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Specimen warranty.

D. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special blocking for hardware, identify cutouts for glazing.

E. Warranty shall be executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 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 if stored more than one week. Break seal on site to permit ventilation.

D. Store flat on level surface in a clean, dry, well ventilated area protected from sunlight.

E. Doors should not be subjected to extremes of heat and/or humidity. Relative humidity should not be less than 25% nor more than 55%.

F. Store doors in closed-in building.

G. Cover doors to keep clean, but allow air circulation.

H. Seal at earliest possible moment. Edge sealing is particularly important.

I. Lift or carry door. Do not drag one door against another.

J. Handle doors with clean hands or clean gloves.

1.07 PROJECT CONDITIONS

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Provide warranty for the following term:
   1. Interior Doors: Life of installation.

D. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Veneer Doors:
   1. Eggers Industries: www.eggersindustries.com.
   2. Southwood: www.southwooddoor.com.
   3. Mohawk Flush Doors, Inc.: www.mohawkdoors.com.
   4. Graham Wood Doors: www.grahamdoors.com
   5. Haley Brothers: www.haleybros.com.
   6. Marshfield Door Systems, Inc: www.marshfielddoors.com.

2.02 DOORS

A. All Doors: See drawings for locations and additional requirements.
   1. Quality Standard: WDMA I.S. 1-A, Custom Grade, Extra Heavy Duty performance.
      a. A Grade veneer
   2. Quality Standard: AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Section 1300, Custom Grade.
   3. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at all locations.
   2. Provide vision panels as scheduled on the drawings.
   3. Fire rated doors: tested to ratings as indicated on drawings in accordance with international building code ("positive pressure"); UL or WH (ITS) labeled without any visible seals when door is closed.
   4. Poplar veneer facing unfinished for field staining and finishing.
      a. Plain Sliced

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core Doors: Type particleboard core (PC), plies and faces as indicated above.

B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above.

2.04 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Species as specified above, veneer grade as specified by quality standard, plain sliced, book veneer match, running assembly match; unless otherwise indicated.
   1. Vertical Edges: Any option allowed by quality standard for grade.
   2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.

B. Facing Adhesive: Type I - waterproof.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Provide solid blocks at lock edge for hardware reinforcement.

1. Provide solid blocking for other through bolted hardware.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

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. Adjust width of non-rated doors by cutting equally on both jamb edges.
1. Trim fire-rated doors in strict compliance with fire rating limitations.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
1. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

D. Use machine tools to cut or drill for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.03 INSTALLATION 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.

3.05 SCHEDULE - SEE DRAWINGS

END OF SECTION

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

D. Aluminum Fixed Glass Frames and Glass

E. Perimeter sealant.

F. Frames scheduled as "AF" on the drawings.

G. Aluminum Brake Metal.

1.02 RELATED REQUIREMENTS

A. Section 07 2501 - Weather Barriers: Perimeter air and vapor seal between glazing system and adjacent construction.

B. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

C. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

D. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2012.

B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2010.

C. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2004.

D. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2004a.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

F. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000.

G. IBC 2012; International Building Code, 2012

1.04 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 IBC code 2021.
   2. Positive Design Wind Load: 20 lbf/sq. ft.
   3. 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. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

G. 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.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, 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. Hardware Schedule: Document coordination with hardware supplier.

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 and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.07 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 which bond to aluminum when exposed to sunlight or weather.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a two year period after Date of Substantial Completion.

C. 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. Kawneer; Product - Tri-Fab VersaGlaze Framing System.
   1. Tri-Fab VG 451T, screw spline for 1 inch glazing
   2. Tri-Fab VG 450, screw spline for 1/4 inch glazing

B. Other Acceptable Manufacturers:
   1. United States Aluminum Corp: www.usalum.com.
   2. Tubelite Inc.: www.tubeliteinc.com
   3. YKKAP American Inc.: www.ykkap.com
   4. Manko Window Systems, Inc.: www.mankowindows.com

2.02 COMPONENTS

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Unitized, shop assembly.
   2. Finish: Dark Bronze No. 40

B. 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: 2 x 4-1/2 inch nominal dimension for 1" glazing.
   4. Cross-Section: 1 ¾ x 4 ½ inch nominal dimension for ¼" glazing.

C. Doors: Glazed aluminum; Kawneer Wide Style 500 Door
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 5 inches wide.
   3. Vertical Stiles: 5 inches wide.
   4. Bottom Rail: 6-1/2 inches wide.
   5. Intermediate Rail: 7-1/8 inch
   6. Glazing Stops: Square.
   7. Finish: Same as storefront.

D. Aluminum Brake Metal
   1. All aluminum brake metal called out on drawings shall be provided by aluminum frame installer.
   2. Thickness: .032 aluminum
   3. Finish: Dark Bronze No. 40

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Fasteners: Stainless steel.

D. Exposed Flashings: 0.032 inch thick aluminum sheet; finish to match framing members.

E. Concealed Flashings: 0.018 inch thick galvanized steel.

F. Perimeter Sealant: Type A specified in Section 07 9005 or as approved by architect.

G. Glass: As specified in Section 08 8000.

H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

I. Glazing Accessories: As specified in Section 08 8000.

2.04 FINISHES

A. Dark Bronze No. 40; AA-M10C21A44; .4 mills thick

B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.05 HARDWARE

A. Door Hardware: All door hardware as specified in Section 08 7100 with the exception of the following that will be provided by storefront supplier.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

2.06 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Arrange fasteners and attachments to conceal from view.

E. Reinforce components internally for door hardware.

F. Reinforce framing members for imposed loads.

G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.

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 where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of mastic and secure.

J. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

K. Install perimeter sealant in accordance with Section 07 9005.

3.03 ERECTION 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 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.05 CLEANING AND PROTECTION

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired

E. Protect finished work from damage.

3.06 SCHEDULE

A. Aluminum-Framed Storefronts as scheduled on the drawings as "AF" Frames to be Tri-Fab 450-451

END OF SECTION

SECTION 08 5653
DRIVE-THRU SLIDING TRANSACTION WINDOW

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes:
1. 48" (w) x 36" (h) drive-thru transaction window.

1.02 SUBMITTALS

A. See Section 01 3323 - Submittals for submittal procedures.

B. Product Data: Submit Manufacturer's technical product data substantiating that product comply.

C. Shop Drawings: Submit for fabrication and installation of windows. Include details, elevations and installation requirement of finish hardware and cleaning.

D. Certification: Provide printed data in sufficient detail to indicate compliance with the contract documents.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver windows crated to provide protection during transit and job storage.

B. Inspect windows upon delivery for damage. Unless minor defects can be made to meet the Architect's specifications and satisfaction, damaged parts should be removed and replaced.

C. Store windows at building site under cover in dry location.

1.04 PROJECT CONDITIONS

A. Field measurements: Check opening by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1.05 WARRANTY

A. All material and workmanship shall be warranted against defects for a period of one (1) year from the original date of purchase.

PART 2 PRODUCTS

2.01 MANUFACTURER'S

A. Basis of design: Design is based on QuickServ Side Sliding Transaction Window Model IFSC-4030.

2.02 MATERIALS

A. Frames: Aluminum

B. Finish: Base and deal tray: Dark Bronze

C. Glazing: ifsc-4030: 1" Clear Insulated Tempered Glass

D. Automation: Self-Closing

PART 3 EXECUTION

3.01 INSTALLATION

A. Install frames and glazing in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed (if approved by the manufacturer and the architect) or replace with new units.

3.02 CLEANING

A. Clean frame and glazing surfaces after installation, complying with requirements contained in the manufacturer's instructions. Remove excess glazing sealant compounds dirt or other substances.

3.03 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that all windows do not incur any damage or deterioration, other than normal weathering, at the time of acceptance.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and hollow steel doors.

B. Hardware for fire-rated doors.

C. Key cylinders for aluminum doors.

D. Thresholds.

E. Weather-stripping, seals and door gaskets.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 - Flush Wood Doors.

1.03 REFERENCE STANDARDS

A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.

B. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.

C. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1996.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.

E. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings:
   1. Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts.
   2. No templates are to be distributed until all Hardware Schedule has been approved by the architect.
   3. Approval of the schedule will not relieve the contractor of the responsibility of furnishing all necessary hardware.
   4. Copies of the approved schedule with necessary templates are to be furnished by the hardware suppliers to other affected subcontractor or material supplier.
   5. Include with each schedule a door index, list of related information to facilitate checking by architect.

C. Keys: Deliver with identifying tags to City of Jonesboro by security shipment direct from hardware supplier.

D. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in City of Jonesboro's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with three years of experience.

C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

1.08 COORDINATION

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

B. Furnish templates for door and frame preparation.

C. Coordinate City of Jonesboro's keying requirements during the course of the Work.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for door closers.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS

A. Provide products that comply with the following:
   1. Applicable provisions of Federal, State, and local codes.
   2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
   3. Applicable provisions of NFPA 101, Life Safety Code.
   4. Fire-Rated Doors: NFPA 80.
   5. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
   6. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
   7. **NO substitutions on Sargent locks and Panics.**
   8. Hardware other than locks and panics may be approved by architect.

B. Finishes: Identified in schedule at end of section.
   1. US 26D Satin Chrome, all hardware except items listed below.
   2. US 32D Satin Stainless Steel: Wall stops, push, pull and kick plates.
   3. Door Closers: Finish to be 689 aluminum painted.

2.03 KEYING

A. Door Locks: All cylinders and lock cores provided in this phase of construction to have Sargent 'RG' keyway (facility standard).
   1. Establish new master key system for this phase of construction.
   2. Keying of specific spaces to be determined by owner.

B. Supply keys in the following quantities:
   1. 6 master keys.
   2. 3 change keys for each lock.
   3. Stamp key bows "Do not duplicate"

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

D. Mounting heights for hardware from finished floor to center line of hardware item:
   1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
   2. For steel doors and frames: See Section 08 1113.
   3. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   4. Wood doors: See Section 08 1416.

3.03 ADA GUIDELINES

A. All hardware must meet guidelines as stated in the Americans with Disabilities Act. This includes locksets, closers, thresholds, etc.

B. Rough-in for all hardware to be located within handicap reach limitations as outlined in the Americans with Disabilities Act.

C. Note: Door thresholds and closers must meet ADA requirements.

3.04 FIELD QUALITY CONTROL

A. Hardware supplier to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.05 ADJUSTING

A. Adjust hardware for smooth operation.

3.06 PROTECTION

A. Do not permit adjacent work to damage hardware or finish.

3.07 SCHEDULE

A. See attached.

2.01 MATERIALS

Manufacturer's Index:

H ..... HAGER
N ..... NORTON

2.02 HARDWARE SCHEDULE

The following is a general listing of hardware requirements and is not intended to be a final hardware schedule. Any items of hardware required by good practice or to meet state and local codes shall be furnished whether or not specifically called out in the below listed groups.

Abbreviations:			
	Alum	=	Clear / Mill Aluminum
	DW	=	Door Width
	DH	=	Door Height
	DOW	=	Door Opening Width
	DOH	=	Door Opening Height
	TBD	=	To Be Determine

SET 1		Door #: 100	
Each To Have:			
H	2 ea	Continuous Hinge	780-112 – BRZ
H	2 ea	Exit Device	4608 x 46CE x WTN x BLK
H	1 ea	Removable Mull	4900U x USP
H	1 ea	Door Closer	5201 x DBZ
H	1 ea	Automatic Opener	8418 x DBZ
H	1 ea	Wall Actuators	2-659-0172
H	1 ea	Wireless Receiver	2-659-0183
H	1 ea	Vestibule Actuator	2-659-0242
H	2 ea	Wireless Transmitter	2-659-0185
H	1 ea	Post	2-659-0180

- Balance of Hardware by door supplier

SET 2		Door #: 101	
Each To Have:			
H	2 ea	Continuous Hinge	780-112 – BRZ
H	2 ea	Dummy Exit Device –	4600 Dummy x 46DT x WTN x BLK
H	1 ea	Door Closer	5201 x DBZ
H	1 ea	Automatic Opener	8418 x DBZ
H	1 ea	Wall Actuators	2-659-0172
H	1 ea	Wireless Receiver	2-659-0183
H	1 ea	Vestibule Actuator	2-659-0242
H	2 ea	Wireless Transmitter	2-659-0185
H	1 ea	Post	2-659-0180

- Balance of Hardware by door supplier

SET 3		Door #: 116.1	
Each To Have:			
H	6 ea	Hinge	BB1279 4.5" x 4.5" US26D
H	2 ea	Exit Device	4608 x 46CE x WTN x US32D
H	1 ea	Removable Mull	4900U x USP
H	2 ea	Door Closer	5201 x AL
H	2 ea	Kickplate	190 x 10" x 2"LDW x US32D
H	2 ea	Wall Stop	236W x US32D
H	2 ea	Silencer	307D

SET 4		Door #: 116.2, 115.1, 108.1	
Each To Have:			
H	3 ea	Hinge	BB1279 4.5" x 4.5" US26D
H	1 ea	Exit Device	4608 x 46CE x WTN x US32D
H	1 ea	Door Closer	5201 x AL
H	1 ea	Kickplate	190 x 10" x 2"LDW x US32D
H	1 ea	Floor Stop	267F x US32D
H	1 ea	Weatherstrip	891SV DW x DH x AL
H	1 ea	Door Sweep	756S x DW x AL
H	1 ea	Threshold	412S xDW x AL

SET 5		Door #: 117, 104, 107, 106, 109, 108.2, 121, 110	
Each To Have:			
H	3 ea	Hinge	BB1279 4.5" x 4.5" US26D
H	1 ea	Lockset (Storeroom Function)	3580 WTN x 2 ¾" BS x US26D
H	1 ea	Door Closer	5201 x AL
H	1 ea	Wall Stop (convex)	232W x US32D
H	3 ea	Silencer	307D

SET 6		Door #: 113,	
Each To Have:			
H	6 ea	Hinge	BB1279 4.5" x 4.5" US26D
H	1 ea	Lockset (Storeroom Function)	3580 WTN x 2 ¾" BS x US26D
H	2 ea	Flushbolts	282D x 26D
H	2 ea	Wall Stop (concave)	236W x US32D
H	2 ea	Silencers	307D

SET 7		Door #: 102, 122, 118,	
Each To Have:			
H	3 ea	Hinge	1279 4.5" x 4.5" US26D
H	1 ea	Lockset (Classroom Function)	3570 WTN x 2 ¾" BS x US26D
H	1 ea	Wall Stop (concave)	236W x US32D
H	3 ea	Silencers	307D

SET 8		Door #: 103, 120, 119,	
Each To Have:			
H	3 ea	Hinge	1279 4.5" x 4.5" US26D
H	1 ea	Lockset (Office Function)	3553 WTN x 2 ¾" BS x US26D
H	1 ea	Wall Stop (concave)	236W x US32D
H	3 ea	Silencers	307D

SET 9		Door #: 105	
Each To Have:			
H	3 ea	Hinge	1279 4.5" x 4.5" US26D
H	1 ea	Lockset (Office Function)	3553 WTN x 2 ¾" BS x US26D
H	1 ea	Deadbolt	3215 x US26D
H	1 ea	Wall Stop (concave)	236W x US32D
H	3 ea	Silencers	307D

SET 10		Door #: 111, 112	
Each To Have:			
H	3 ea	Hinge	1279 4.5" x 4.5" US26D
H	1 ea	Push Plate	30S 4" x 16" x US32D
H	1 ea	Pull Plate	33E 4" x 16" x US32D
H	1 ea	Door Closer	5201 x AL
H	1 ea	Kickplate	190 x 10" x 2"LDW x US32D
H	3 ea	Silencers	307D

SET 11		Door #: 114	
Each To Have:			
H	3 ea	Hinge	1279 4.5" x 4.5" US26D
H	1 ea	Lockset (Passage)	3510 WTN x 2 ¾" BS x US26D
H	1 ea	Overhead Stop	6016-S-SZ2 x US32D
H	3 ea	Silencers	307D

END OF SECTION

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.
   1. Glass for aluminum doors and frames
   2. Glass for wood doors

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames: Glazed doors and borrowed lites.

B. Section 08 1416 - Flush Wood Doors: Glazed doors.

C. Section 08 4313 - Aluminum-Framed Storefronts.

1.03 REFERENCES

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1999 (Reapproved 2005).

C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2010.

D. ASTM C 1036 - Standard Specification for Flat Glass; 2001.

E. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.

F. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass; 2009.

G. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2005.

H. ASTM E 773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units; 2001.

I. ASTM E 774 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units; 1997.

J. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 2004.

K. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 2008.

1.04 PERFORMANCE REQUIREMENTS

A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
   1. In conjunction with vapor retarder and joint sealer materials described in other sections.
   2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
   3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

1.05 CODE REQUIREMENTS

A. IBC-2021, Sec. 2403 – Each lite shall bear manufacturer's label designating the type and thickness of the glass. Each unit of tempered glass shall be permanently identified by the manufacturer. The identification shall be etched or ceramic fired on the glass and be visible when the unit is glazed.

B. IBC-2021, Sec. 2406 – Individual glazed areas in hazardous locations shall pass the test requirements of 'Safety Standard for Architectural Glazing Materials' Consumer Product Safety Commission (CPSC) 16 CFR 1201 or by comparative test shall be proved to produce at least equivalent performances.

1.06 SUBMITTALS

A. See Section 01 3323 - Submittals, 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.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.08 ENVIRONMENTAL REQUIREMENTS

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.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide a five (5) year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

C. Provide a five (5) year warranty to include coverage for delamination of laminated glass and replacement of same.

PART 2 PRODUCTS

2.01 FLAT GLASS MATERIALS

A. Manufacturers:
   1. TGP, Technical Glass Industries, Kirkland, Washington
   2. Sumiglass, Columbus, Ohio
   3. PPG Industries, Inc: www.ppgglazing.com.
   4. AGC, Glass Company www.us.agc.com
   5. Pilkington

B. Clear Float Glass: Clear, annealed.
   1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).

C. Safety Glass: Clear; fully tempered with horizontal tempering.
   1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select) and ASTM C 1048.
   2. Comply with 16 CFR 1201 test requirements for Category II.
   3. Provide this type of glazing in the locations required by code.
      a. Glazed lites in doors.
      b. Glazed sidelights to doors.

D. High Performance Glass:
   1. Low Emissivity.
      a. Solarban 60 on Surface #3
   2. Tempered where required
   3. Tramsmittance Visibility =35%
   4. Reflectance Visibility (out) =7%
   5. Reflectance Visibility (in) =10%

2.02 SEALED INSULATING GLASS UNITS

A. Manufacturers:

1. Any of the manufacturers specified for float glass.

B. Sealed Insulating Glass Units: Types as indicated above.
   1. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
   2. Edge Spacers: Aluminum, bent and soldered corners.
   3. Edge Seal: Glass to elastomer with supplementary silicone sealant.
   4. Purge interpane space with dry hermetic air.

C. Insulated Glass Units 3.0 pounds per square foot: Double pane with glass to elastomer edge seal.
   1. Outer pane of tinted glass, inner pane of clear glass.
   2. Comply with ASTM E 774 and E 773, Class CBA.
   3. Purge interpane space with dry hermetic air.
   4. Total unit thickness of 1 inch minimum.

D. Edge Seal Construction: Aluminum, bent and soldered corners.

E. Edge Seal Material: Black color.

2.03 GLAZING COMPOUNDS

A. Manufacturers:
   1. Bostik, Inc: www.bostik-us.com.
   2. GE Plastics: www.geplastics.com.
   3. Pecora Corporation: www.pecora.com.
   4. Sonneborn, ChemRex, Inc.: www.chemrex.com

B. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; Shore A Hardness Range 20 to 35; color as selected.
   1. Metal to brick, concrete, concrete block

C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.
   1. Glass to metal
   2. Glass to glass

2.04 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. 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 C 864 Option I. 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: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
   1. Manufacturers:
      a. Pecora Corporation: www.pecora.com.
      b. Saint-Gobain Performance Plastics: www.plastics.saint-gobain.com.

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 C 1193 and FGMA Sealant Manual.

E. Install sealant 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 inches 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 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.05 PROTECTION OF FINISHED WORK

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

3.06 SCHEDULE

A. Fixed Glass at Exterior Aluminum Frames: "AF" Frames
   1. Shown on drawings as Insulating Glass.
   2. Glass to be 1 inch thick insulating units.
   3. Inner Layer: 1/4 inch clear float glass, annealed
   4. Outer Layer: 1/4 inch "Solarcool Gray #2" (AGC), float type, heat strengthened
   5. Tempered safety glass where required by code.
   6. Spandrel glass where shown on drawings.

B. Interior Aluminum Frames: “AF” Frames
   1. 1/4 inch clear float glass, annealed.
   2. Tempered safety glass where required by code.

C. Interior Wood Door Lites:
   1. 1/4" clear tempered glass.

F. See schedules on drawings.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior Metal stud wall framing.

B. Cementitious Backer Board.

C. Gypsum Board Walls: Non-rated.

D. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking for support of wall-mounted equipment.

B. Section 07 2116 - Blanket Insulation: Exterior and interior wall insulation.

C. Section 09 3000 – Tiling.

D. Section 09 9000 - Painting and Coating.

1.03 REFERENCE STANDARDS

A. ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002.

B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members; 2004a.

C. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2004.

D. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 2004a.

E. ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2004.

F. ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2009.

G. ASTM C 1396/C 1396M - Standard Specification for Gypsum Board; 2004.

H. GA-600 - Fire Resistance Design Manual; Gypsum Association; 2003.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Provide recommendations for expansion/control joints to meet manufacturer's requirements.

1.05 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
   1. Maintain one copy of standards at project site.

B. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum 3 years of documented experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated assemblies as follows:
   1. Fire Rated Barrier: Listed assembly by
      a. UL No. U419 - 1 hour rating
      b. UL No. U415 - 2 hour rating

PART 2 PRODUCTS

2.01 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clark Steel Framing Systems: www.clarksteel.com.
   2. Dietrich Metal Framing: www.dietrichindustries.com.
   3. United States Gypsum Company.www.usg.com

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.

C. Non-Loadbearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
   1. Studs: "C" shaped with knurled faces.
   2. Runners: U shaped, sized to match studs.

D. Furring hat-shaped channels: 7/8"; furring channels; 18 gauge.

E. Z-Shaped Furring Channels: 1 ½"; furring channels; 18 gauge.

F. Framing Schedule
   1. Exterior Walls: See Section 06 1000 – Rough Carpentry
   2. Interior Partitions: (and misc. framing)
      a. 2x4, 2x6 wood studs
   3. Floor Joists:
      a. 20" wood I-Joists. See Section 06 1733.

2.02 GYPSUM BOARD MATERIALS

A. Manufacturers:
   1. G-P Gypsum Corporation: www.gp.com/gypsum.
   2. National Gypsum Company: www.nationalgypsum.com.
   3. USG: www.usg.com.
   4. CertainTeed Gypsum: www.certainteed.com/gypsum.

B. Gypsum Wallboard: ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.
   1. Regular Type:
      a. Application: Use for vertical surfaces, unless otherwise indicated.
      b. Thickness: 5/8 inch, as indicated.
      c. Edges: Tapered.
   2. Water-Resistant Gypsum Board: ASTM C 1396/C 1396M; ends square cut.
      a. Application: at all vertical surfaces at toilets, janitor closets, areas with a lavatory, and mechanical rooms unless noted otherwise.
      b. Type: Type X
      c. Thickness: 5/8 inch
      d. Edges: tapered

2.03 FIBERGLASS FACED BOARD MATERIALS

A. Manufacturer: Modulars, Inc., "Wonder Board"

B. Cementitious Backer Board: ANSI A118.9, aggregated portland cement panels with glass fiber mesh embedded in front and back surfaces, 5/8 inch thick.
   1. Application: Behind all ceramic wall tile.
   2. Joint Tape: 2" wide fiberglass tape embedded in skim coat of mortar.

2.04 ACCESSORIES

A. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.

B. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.

C. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.
   1. 1" type S bugle head for single layer of 5/8" gypsum board to metal studs.
   2. 1-5/8" type S bugle head for 2 layers of gypsum board to metal studs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.
   1. All framing components shall be cut squarely for attachment to perpendicular members, or as required for angular fit against abutting members. Members shall be held positively in place until properly fastened.
   2. Studs shall be plumbed, aligned, and securely attached to each side of the flange or web at the top and bottom tracks.
   3. Splices in studs shall not be permitted.
   4. Jack studs shall be installed below window sills, above window and door headers, at free standing stair rails, and elsewhere to furnish structural support and shall be securely attached to supporting members.
   5. Wall stud bridging shall be installed as per manufacturer's recommendations.
   6. Attach steel runner at floor at all exterior and interior partitions with hardened steel studs. Place studs with open side facing in same direction. Attach studs to runners per manufacturer's instructions.

B. Studs: Space studs at 16 inches on center (12 inch o.c. at corridor bearing walls).
   1. Extend partition framing to structure where indicated and brace all partitions to structure.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

D. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, toilet accessories, and hardware. Comply with Section 06 6100 for wood blocking.

3.03 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. See section 07 2116 for insulation.

3.04 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C 840 and manufacturer's instructions. Install to minimize butt end joints.

B. Single-Layer Non-Rated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.

C. Cementitious Backing Board: Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

D. Installation on Metal Framing: Use screws for attachment of all gypsum board.

E. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

3.05 CEMENTITIOUS BACKER BOARD INSTALLATION

A. Install over steel framing members where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

B. Install cementitious backer board at soffits perpendicular to framing; end joints to be over framing member.

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. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed all-purpose joint compound and finished with ready-mixed all-purpose joint compound.

B. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840 and as scheduled below.

C. 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.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.09 FINISH LEVEL SCHEDULE

A. Level 5: All walls and ceilings
   1. ASTM C840, GA214; Level 5 finish
      a. Tape in joint compound at joints and interior angles.
      b. Three (3) separate coats of compound at joints, angles, fasteners, and accessories. Compound shall be smooth and free of tool marks and ridges.
      c. Final skim coat of compound over entire surface of gypsum board.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall and vertical applications.

C. Ceramic trim.

D. Trim and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 5500 - Metal Stair Nosings.

B. Section 07 9005 - Joint Sealers.

C. Section 09 2116 - Gypsum Board Assemblies; for cementitious backer board.

1.03 REFERENCE STANDARDS

A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 1999.

B. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999.

C. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 1988.

D. ASTM C373: Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products.

E. ASTM C 482: Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement.

F. ASTM C 485: Standard Test Method for Measuring Warpage of Ceramic Tile.

G. ASTM C 499: Standard Test Method for Facial Dimensions and Thickness of Flat, Rectangular Ceramic Wall and Floor Tile.

H. ASTM C 501: Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.

I. ASTM C 648: Standard Test Method for Breaking Strength of Ceramic Tile.

J. ASTM C 650: Standard Test Method for Resistance of Ceramic Tile to Chemical Substrates.

K. ASTM C 1026: Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling.

L. ASTM C 1028: Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method.

M. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of North America, Inc.; 2005.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Provide product samples for color selection.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum 5 years of documented experience.

B. Installer Qualifications: Company specializing in performing tile installation, with minimum of 3 years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives 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. Manufacturers:
1. Crossville Ceramics Company, Crossville, Tennessee.
2. American Olean: www.americanolean.com
3. Dal-Tile: www.daltile.com.

B. Floor Tile: Porcelain (Unpolished)
1. Size and Shape: 12" x 24" (T-01A, T-02A)
2. Finish: Unpolished.
3. Water Absorption: < 0.10%, ASTM C373.
4. Breaking Strength: > 425 lbf, ASTM C648.
5. Coefficient of Friction: Wet – 0.42-0.52
6. Frost Resistance: Resistant, ASTM C1026.
7. Equal to Crossville, Inc.; "Empire" Porcelain Stone.
8. Color/Finish: To be selected.
9. Edge: Rectified.
10. Trim:
    a. Size and Shape: 6" x 12" (TB-01) cove base.
    b. Color/Finish: "Match Floor Tile" (Unpolished).

C. Wall Tile: Porcelain (Unpolished)
1. Size and Shape: 12" x 24" (T-01A)
2. Finish: Unpolished.
3. Water Absorption: < 0.10%, ASTM C373.
4. Breaking Strength: > 425 lbf, ASTM C648.
5. Coefficient of Friction: Wet – 0.42-0.52
6. Frost Resistance: Resistant, ASTM C1026.
7. Equal to Crossville, Inc.; "Empire" Porcelain Stone.
8. Color/Finish: To be selected.
9. Edge: Rectified.
10. Trim:
    a. Size and Shape: 4" x 24" (TB-03) single bullnose trim

2.02 TRIM AND ACCESSORIES - METAL

A. Manufacturer: Metal Transitions
1. Schluter Systems L.P., Plattsburgh, New York
2. Futura Industries: www.futuraind.com

B. Transition Schedule:
1. Porcelain Tile to Carpet: Schluter "Reno-TK"
2. Porcelain Tile to Vinyl Tile: Schluter "Reno-TK"
3. Vinyl Tile to Carpet: Schluter "Reno-TK"
4. Vinyl Tile to Concrete: Futura "Tile Reducer for Resilient Floors"

C. Finish-All Transitions: Satin Nickel Anodized Aluminum

2.03 TRIM AND ACCESSORIES

A. Trim: Matching bullnose in sizes coordinated with field tile.
   1. Applications: Use in the following locations:
      a. Open Edges: Bullnose.
   2. Manufacturer: Same as for tile.

2.04 MORTAR MATERIALS

A. Manufacturers:
   1. Laticrete International, Inc.; www.laticrete.com
      a. Mortar for Floors only: Laticrete LHT
      b. Mortar for floors and Walls: Laticrete 4-XLT
   2. Meet ANSI A118.4.

2.05 GROUTS

A. Manufacturers:
   1. Bostik, Inc.; Product: "True Color", pre-mixed, ready to use urethane grout.

B. Meets ANSI A118.3
   1. Color: As selected.

2.06 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturer's written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
   4. 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
   1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.

2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

D. Field-Applied Temporary Protective Coating: Where indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.03 INSTALLATION GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation". Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in pattern indicated on interior design (1D) drawings. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Refer to tile patterns indicated on interior design drawings. (1D2.01 and 1D2.02)

F. Lay out tile wainscots to next full tile or as indicated on interior design (1D) drawings: Refer to patterns and details indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Grout tile to comply with requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

3.04 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
   1. Follow TCA procedures for 95% mortar coverage.

B. Joint Widths: Install tile on floors with the following joint widths:
   1. Porcelain Tile: 1/8 inch.
   2. Quarry Tile: 13/8 inch.

3.05 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:
   1. Porcelain Tile: 1/8 inch.
   2. Marble Mosaic Tile: 1/8 inch.

3.06 CLEANING AND PROTECTION

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

B. For unglazed tiles and stone products apply coat of neutral protective cleaner grout release to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.07 FLOOR TILE INSTALLATION SCHEDULE

A. Tile Installation: Interior floor installation on concrete; thin-set mortar; TCA 125A-05 and ANSI A118.4.
   1. Tile Type: As indicated in Finish and Color Schedules.
   2. Thin-Set Mortar: Latex- portland cement mortar.
   3. Grout: Polymer-modified sanded or Polymer-modified unsanded grout per joint size and tile type indicated.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

B. Section 23 3700 - Air Inlets and Outlets: Air diffusion devices in ceiling.

C. Section 26 0548 - Vibration and Seismic Controls: For seismic connections to ceiling system.

C. Section 26 5000 - Interior Lighting: Light fixtures in ceiling system.

1.03 REFERENCE STANDARDS

A. ASTM C 423 - Standard Text Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2009b.

C. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2004.

D. ASTM D 3273 - Standard Test Method for Resistance to Growth Mold on the Surface of Interior Coatings in an Environmental Chamber.

E. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint; 2002.

F. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998.

G. ASTM E 1477 - Standard Test Method for Luminous Reflectance factor of Acoustical Materials by Use of Integrating -Sphere Reflectometers

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Samples: Submit two samples 4 x 4 inch in size illustrating material and finish of acoustical units.

D. Samples: Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.07 PROJECT CONDITIONS

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. Install acoustical units after interior wet work is dry.

1.08 EXTRA MATERIALS

A. Provide 5 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc; Product Fine Fissured, www.armstrong.com.
   2. BPB Celotex; Product Capaul: www.bpb-na.com.
   3. USG: www.usg.com.
   4. Certain Teed Ceilings: www.certainteed.com

B. Acoustical Units - General: ASTM E1264, Class A.

C. Acoustical Panels Type A: Painted mineral fiber, ASTM E 1264 Type III, with the following characteristics:
   1. Size: 24 x 24 inches.
   2. Thickness: 5/8 inches.
   3. Composition: Wet formed.
   4. Light Reflectance: 82 percent, determined as specified in ASTM E1264.
   5. NRC: 0.55, determined as specified in ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 33, determined as specified in ASTM E1264.
   7. Edge: Square.
   8. Surface Color: White.
   9. Surface Pattern: Non-directional fissured.
   10. Performance: No visible sag under conditions not to exceed 90 degrees F. and 90 percent humidity.
   11. Product: "Fine Fissured", product 1728 by Armstrong.

2.02 SUSPENSION SYSTEM(S)

A. Manufacturers:
   1. Same as for acoustical units.

B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.

C. Exposed Steel Suspension System Type 1: Formed galvanized steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; Double flange, for square edge panels, 15/16 inch wide face.
   2. Construction: Double web.
   3. Finish: White painted.
   4. Product: Prelude XL, 7301 by Armstrong.
   5. Size: 24 inches x 24 inches.

2.03 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.

C. Touch-up Paint: Type and color to match acoustical and grid units.

D. Provide hold down clips at ceiling tiles at entry foyers/vestibules.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.

B. Suspended acoustical ceiling systems shall be installed in accordance with the provisions of ASTM C635 and ASTM C636, earthquake resistant bracing/tying.
   1. Note: All suspended ceiling grid to be supported in accordance with ASTM Design E 580-78 (R84) for Zone 3, seismic; see detail on drawings. IBC code, category D, site classification C.

C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

D. Locate system on room axis according to reflected plan.

E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

F. 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.

G. 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.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

K. 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.

3.03 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. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.
   3. Double cut and field paint exposed reveal edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 10 ft of an exterior door.

3.04 ERECTION 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.

3.05 SCHEDULE

A. Typical 24" x 24" ceiling scheduled as "Acoustical Ceiling System – Type 'A'"
   1. Acoustical panels: Type A
   2. Suspension grid: Type 1

END OF SECTION

SECTION 09 6800
CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet Tiles (modular)

B. Broadloom carpet for direct-glued installation

C. Accessories

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete

B. Section 06 1636 – Wood Panel Product Sheathing (decking at platforms and ramps)

C. Section 06 2000 – Finish Carpentry (wood nosing)

D. Section 09 6500 - Resilient Flooring - Base

1.03 REFERENCE STANDARDS

A. ASTM D 2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2006.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

C. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2009a.

D. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2009.

E. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials

F. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 2002.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Shop Drawings: Lay-out of carpet tiles.

C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

D. Samples: Submit two samples illustrating color and pattern for each carpet material specified.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum three years experience.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

1.07 WARRANTY

A. Modular Tiles: Manufacturer's limited 15 year warranty against excessive surface wear, edge ravel, backing separation, shrinking, stretching, and static electricity.

B. Broadloom Carpet: Endure Plus / TitanBac Plus warranties

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carpet Tiles:
   1. J&J Flooring Group LLC, www.jjflooringgroup.com
   2. Mohawk Group, Bigelow Commercial; www.bigelowcommercial.com
   3. Interface Flor Commercial; www.interfaceflor.com
   4. Cambridge Carpet; www.bolyu.com
   5. Mannington Commercial; www.manningtoncommercial.com

2.02 CARPET

A. Modular Carpet: (CP-01)
   1. Size and Shape: 12" x 48"
   2. Backing: Nexus Modular
   3. Construction: Textured Loop
   4. Face Weight: 28 oz./ square yard
   5. Pile Density: 8490 oz.
   6. Equal to: Convergent 7925 by J+J Flooring
   7. Color/Finish: To be selected.

2.03 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Moldings and Edge Strips: Vinyl glue-down reducer; #160 3/16" reducer by Roppe. Provide standard color options for architects approval.

C. Adhesives – Adhesive as recommended by manufacturer.

D. Seam Adhesive: Recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet in accordance with manufacturer's instructions and CRI Carpet Installation Standard.

C. Install carpet in accordance with manufacturer's instructions.

D. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

E. Broadloom; Verify carpet match before cutting to ensure minimal variation between dye lots.

F. Broadloom: Lay out carpet and locate seams in accordance with shop drawings:
   1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   2. Do not locate seams perpendicular through door openings.
   3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
   4. Locate change of color or pattern between rooms under door centerline.
   5. Provide monolithic color, pattern, and texture match within any one area.

3.04 INSTALLATION - CARPET TILES

A. Carpet tiles to be laid in strict accordance with manufacturer's printed instructions.

B. Carpet tiles will be laid with pattern as described in the finish schedule.

C. Tile adhesive per manufacturer's recommendations.

3.05 DIRECT-GLUED CARPET

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

F. Complete installation of edge strips, concealing exposed edges.

3.06 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

3.07 SCHEDULE

A. See Finish Schedule on Drawings.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 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:

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. Floors, unless specifically so indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

F. See Schedule - Surfaces to be finished, at end of Section.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 – Unit Masonry.

B. Section 05 5000 – Metal Fabrications: Shop Primed Items.

C. Section 05 5213 – Pipe and Tube Railings – Shop Primed Items.

D. Section 08 1113 – Hollow Metal Doors and Frames

E. Section 08 1416 – Flush Wood Doors

F. Section 09 2116 – Gypsum Board Assemblies

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.

1.04 DEFINITIONS

A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on all finishing products, including VOC content.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.07 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.

1.08 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. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

F. 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:
   1. Farrell-Calhoun; http://www.farrellcalhoun.com
   2. Sherwin Williams; www.sherwinwilliams.com
   3. Approved Equals

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
   1. 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.
   2. Supply each coating material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. 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.

D. All materials to be first line, best quality, of the manufacturer.

E. Chemical Content: The following compounds are prohibited:
   1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

2.03 PAINT SYSTEMS - EXTERIOR

A. Ferrous Metals, Unprimed, Alkyd, 3 Coat:

1. One coat of alkyd primer:
   a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
   b. FC Tuff-Boy Rust-Stop Primer 1022 (White)
2. Gloss: Two coats of alkyd enamel:
   a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
   b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

B. Ferrous Metals, Primed, Alkyd, 3 Coat:
1. a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
   b. FC Tuff-Boy Rust-Stop White Primer 1022.
2. Gloss: Two coats of alkyd enamel:
   a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
   b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

C. Galvanized Metals, Alkyd, 3 Coat:
1. a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
   b. FC 100% Acrylic All Purpose Metal DTM Primer 5-56.
2. Gloss: Two coats of alkyd enamel:
   a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
   b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

2.04 PAINT SYSTEMS - INTERIOR

A. Wood, Transparent, Varnish, Stain:
1. One coat of stain:
   a. SW Wood Classics Oil Stain, Series A 49-200.
   b. FC Wood Kraft Penetrating Wiping Stains 1110/1400.
2. One coat sealer:
   a. SW Wood Classics Sanding Sealer, Series B26V43.
   b. FC Wood Kraft Satin Sanding Sealer 1100.
3. Satin: Two coats of varnish:
   a. SW Wood Classics Oil Varnish, Series A66-300.
   b. FC Wood Kraft Satin Polyurethane Varnish 1122.

B. Wood, Opaque, Latex, 3 Coat:
1. One coat of latex primer sealer:
   a. SW Preprite Classic Latex Primer
   b. FC 100% Acrylic Enamel Undercoater 699.
2. Semi-gloss: Two coats of latex enamel:
   a. SW Proclassic, Waterborne Acrylic Satin, Series B20.
   b. FC 100% Acrylic Interior Semi-Gloss Latex Enamel 600 Line

C. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer:
   a. SW Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
   b. FC Tuff-Boy Rust-Stop Primer 1022 (White), 1025 (Red), or 1069 (Gray).
2. Gloss: Two coats of alkyd enamel:
   a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
   b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

D. Ferrous Metals, Primed, Alkyd, 2 Coat:
1. a. W Pro Industrial Pro-Cryl Universal Acrylic Primer Off White
   b. FC Tuff-Boy Rust-Stop White Primer 1022.
2. Gloss: Two coats of alkyd enamel:
   a. SW Pro Industrial DTM Acrylic Semi-Gloss Extra White
   b. FC Tuff-Boy Industrial Gloss Enamel 800 Line.

E. Gypsum Board, Acrylic, 3 Coat:
1. One coat of primer sealer:

a. SW Preprite Classic Latex Wall Primer; mix block filler to provide slight texture.
b. FC Perfik-Seal Interior Latex Primer/Sealer 380

2. Semi-gloss: Two coats:
a. SW Duration Interior Latex Semi-Gloss.
b. FC 100% Acrylic Interior Semi-Gloss Latex Enamel 600 Line

F. Stenciling of Fire Rated Partitions:
1. Painting contractor is to paint/stencil 1 hr. fire rated walls. Stencil partition above suspended ceilings at 8'-0" on centers with 2" high letters to read: "FIRE AND SMOKE BARRIER PROTECT ALL OPENINGS".

G. Concrete/masonry, Opaque, Acrylic, 3 Coat:
1. First Coat:
a. SW Loxon Exterior Masonry Acrylic Primer.
b. FC 100% Acrylic Bonding Masonry Primer 697.
2. Second and Third Coats:
a. SW Loxon Exterior Masonry Acrylic Top Coat.
b. FC 100% Acrylic Exterior Enamel 200 (Flat), 2200 (Satin), or 2400 (Gloss).

H. All exposed piping and ductwork to be painted.

I. Metal deck and roof structure to receive paint.
1. One coat of SW KEM Kromick metal primer if structure unprimed.
2. One coat of SW Dryfall Flat (B48), 3-5 dry mils.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

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.

D. Surfaces: Correct defects and clean surfaces which affect work of this section.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Concrete and Unit Masonry Surfaces to be painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

H. 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 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.

I. 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.

J. 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.

K. Interior wood items 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.

L. Wood Doors to be field-finished: Seal wood door top and bottom edge surfaces with clear sealer.

M. Metal Doors to be painted: Prime metal door top and bottom edge 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. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Use paint systems defined for the substrates to be finished.

B. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.

3.05 FIELD QUALITY CONTROL

A. The painting contractor shall be responsible for any damage done to the work of other contractors, repairing same to the satisfaction of the architect. At the completion of work, this contractor shall clean off all paint spots, oil, and stain from floors, woodwork, glass, hardware, etc., and leave the entire building in satisfactory condition as far as his work is concerned.

B. All work shall be performed by skilled mechanics. Provide drop clothes and protections for all surfaces not to be painted. All paints, stains, varnishes, and other finishes shall be evenly spread and flowed on and shall be free of runs, sags, and other defects. Each coat shall be thoroughly dry before applying succeeding coats. To product smooth and even finishes, all enamel or varnish applied to wood or metals shall be sanded between coats with fine sand paper. No exterior painting will be allowed during rainy, damp, or freezing weather. No interior painting will be permitted when temperature is below 50 degrees F. No painting will be permitted until all surfaces to be painted are dry.

3.06 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.07 SCHEDULE - SURFACES TO BE FINISHED

A. Do Not Paint or Finish the Following Items:

1. Items fully factory-finished unless specifically noted.
2. Fire rating labels, equipment serial number and capacity labels.
3. Stainless steel items.

B. Paint the surfaces described below under Schedule - Paint Systems and as indicated in the Finish Schedule on the drawings.

C. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.08 SCHEDULE - PAINT SYSTEMS

A. Interior Masonry: Finish all surfaces exposed to view.

B. Gypsum Board: Finish all surfaces exposed to view.

C. Wood: Finish all surfaces exposed to view.

D. Wood Doors: All surfaces.

E. Steel Doors and Frames

F. Steel Fabrications: Finish all surfaces exposed to view.

G. Galvanized Steel: Finish all surfaces exposed to view.

H. Pipe and Duct Insulation Jackets: Finish all surfaces exposed to view.

I. Exposed steel, pipe railings, metal stairs, all exposed metal.

J. Shop-Primed Metal Items: Finish all surfaces exposed to view.
   1. Finish the following items:
      a. Exposed surfaces of lintels.

K. Paint all items where ceiling is "exposed to structure above", unless noted otherwise.

L. Metal gyp. board reveals at all walls.

3.09 SCHEDULE - COLORS

A. A complete Color Schedule will be issued by the architect.

END OF SECTION

SECTION 09 9656
EPOXY COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Two component epoxy coating system (bathroom walls).

B. Accessories

1.02 RELATED SECTIONS

A. Section 09 9000 – Painting and coating

1.03 REFERENCES

A. ASTM D 3730 – Standard guide for testing high-performance interior architectural wall coatings.

1.04 SUBMITTALS

A. See Section 01 3323 – Submittals

B. Product Data: Provide data on all finishing products, including VOC content.

1.05 DELIVERY, STORAGE, AND PROTECTION

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, clean-up requirements, color designation, and instructions for mixing and reducing.

C. 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.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Minimum Application Temperatures minimum 55 degrees F unless required otherwise by manufacturer's instructions, maximum 100 degrees F.

C. Relative humidity: 85% maximum.

D. Provide lighting level of 80 ft. candles measured mid-height at substrate surface

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The Sherwin-Williams Company; product; water-based catalyzed epoxy, series B70-200.

2.02 MATERIALS

A. Description: two-component water based, catalyzed, epoxy resin coating formulated for high performance use in industrial and commercial environments.

B. Performance
   1. Meets performance requirements of ASTM D3730
   2. Corrosion and chemical resistant
   3. Impact and abrasion resistant
   4. Flash rust resistant
   5. Suitable for USDA Inspected facilities
   6. Low odor and non-flammable
   7. Low VOC
   8. Tested for nuclear irradiation and decontamination, level II

C. Characteristics
   1. Finish: Semi-gloss

2. Color: to be selected
3. solids: 39 percent, plus or minus 2 percent, mixed.
4. Weight solids: 47 percent, plus or minus 2 percent, mixed.
5. VOC: 209 g/l; 1.74 lb. /gal., mixed.
6. Mix ratio: 2 component; 4:1 by volume
7. Recommended spreading rate per coat:
   a. Wet mils: 6.5 – 8.0
   b. Dry mils: 2.5 – 3.0
   c. Coverage: 200 – 250 sq.ft./gal. approximate.
8. Flash Point: 201 degrees F, PMCC, mixed

2.03 ACCESSSORIES

A. Provide all accessories required for a complete application.

PART 3 EXECUTION

3.01 PREPARATION

A. Follow all requirements of Section 09 9000, Painting and Coating, paragraph 3.02

3.02 APPLICATION

A. Maintain temperature requirements as specified.

B. Do not exceed manufacturer's recommended pot life of materials.

C. Follow manufacturer's printed application instructions.

3.03 CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.04 FIELD QUALITY CONTROL

A. Follow all requirements of Section 09 9000, Painting and Coating, Paragraph 3.05

3.05 SCHEDULE – SURFACES TO BE FINISHED

A. Coat the surfaces as indicated in the finish schedule on the drawings.

3.06 COATING SYSTEM

A. Gypsum Board
   1. First coat: SW Preprite 200 Latex Primer at 1.0 – 1.4 mils dft.
   2. Second and third coat: SW Water based catalyzed epoxy at 3.0 mils dft.

B. Concrete Block
   1. First Coat: SW Heavy Duty Block Filler at 10.0 -18.0 dft/ct.
   2. Second and Third Coat: SW water based catalyzed epoxy at 2.5 - 3.0 mils dft/ct.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10 1416
BRONZE PLAQUE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bronze Plaque

1.02 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Submit lay-out of proposed plaque for approval by architect prior to actual casting. Include fastening details, border details, etc.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide bronze plaque with textured background, ground face, no border with ribbon letters, for blind fastening to masonry wall.

B. Lettering and lay-out to be determined.

C. Size: 18" x 20"

PART 3 EXECUTION

3.01 INSTALLATION

A. Install at the direction of the architect; location as shown on drawings.

B. Install in strict accordance with manufacturer's instructions for blind fastening to face of masonry unit.

END OF SECTION

SECTION 10 1419
CAST ALUMINUM LETTERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Building Lettering – Individual Letters (interior and exterior)

1.02 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Provide manufacturer's data lettering material, finish and mounting.

C. Shop drawing showing layout and length required for signage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gemini Incorporated, Cannon Falls, MN.

B. A.R.K. Ramos, Oklahoma City, OK.

C. Metal Arts, Mandan, North Dakota.

2.02 MATERIALS

A. Letters:
   1. Cast aluminum individual letters; minimum 1" thick.
   2. Style: Arial Bold
   3. Size: 12" high letters
   4. Finish: Baked on Enamel Finish
   5. Mounting: Projected spacer mounting to masonry (veneer).

B. Lettering: The following lettering is required and reads as follows:
   1. 12 inch tall lettering to read as follows:
      a. "POINSETT COUNTY COURTHOUSE ANNEX"

PART 3 EXECUTION

3.01 WORKMANSHIP

A. Install in accordance with manufacturer's instructions for projected spacer mounting to masonry (veneer) and wood paneling.

END OF SECTION

SECTION 10 1425
DOOR AND ROOM SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Door Signs.

B. Occupancy Signs

1.02 REFERENCES

A. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board; 2010.

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for sign types specified, including components and accessories.

C. Selection Samples: Two sets of color chips representing manufacturer's full range of available colors.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Sign types to comply with ADAAG requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products of this section in manufacturer's unopened packaging until installation.

B. Maintain dry, heated storage area for products of this section until installation of products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kroy Sign Systems, Scottsdale, Arizona

B. Best Sign Systems, Montrose, Colorado

C. Mohawk Sign Systems, Schenectady, New York.

D. Archway Graphic Designs, Little Rock, AR

2.02 MANUFACTURED UNITS

A. Braille Signs:
   1. Acceptable product: Acrylic Graphic Braille Signs.
   2. Colors: Face color to be selected; graphics and letter color white.
   3. Colors: Selected from manufacturer's full range of available colors.
   4. Sign size: 8 by 8 inches: occupancy signs, 12 x 12 inches.
   5. Graphics: International symbols for indicated information.
   6. Lettering: 5/8 inch high, raised 1/32 inch, with Number 2 Braille coding.
   7. Provide pictograms at all restroom doors/openings.
   8. Unframed signs; edges polished or finished.

B. Lettering Style: Helvetica Medium

C. Accessories: Installation accessories specified in manufacturer's instructions.

2.03 OCCUPANCY SIGNS

A. Quorum Court, Room 116, provide one (1) sign that reads as follows:
   1. "**OCCUPANCY BY MORE THAN 140 PERSONS IS DANGEROUS AND UNLAWFUL**", State fire Marshal

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces to receive signs have been finished, and that finishes are dry and correctly cured.

3.02 INSTALLATION

A. Install room and door signs in accordance with manufacturer's printed installation instructions.

B. Mount signs at 60" above finished floor to centerline of sign on wall to strike side of door.

3.03 SCHEDULE

A. A complete list of door signage wording will be provided to the contractor prior to fabrication of signs. In general, the wording and numbering will follow floor plan designations.

B. Provide one (1) sign for each interior door.

END OF SECTION

SECTION 10 2113
PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid plastic toilet compartments.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry

B. Section 10 2813 - Toilet Accessories.

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals, 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. Submit color samples.

1.04 COORDINATION

A. Coordinate the work with placement of support framing and anchors in wall.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Plastic Toilet Compartments:
   1. Comtec Industries: www.comtecindustries.com.
   2. Santana Products Co., Inc.: www.hinyhider.com.
   3. Accurate Partitions Corp., Lyons, Illinois
   4. General Partitions Mfg. Corp., www.generalpartitions.com.

2.02 COMPONENTS

A. Toilet Compartments: Solid molded plastic panels, doors, and pilasters, floor-mounted headrail-braced partitions.
   1. Color: To be selected.

B. Door and Panel Dimensions:
   1. Thickness: 1 inch.
   2. Door Width: 24 inch.
   3. Door Width for Handicapped Use: 36 inch, out-swinging.
   4. Height: 55 inch.
   5. Thickness of Pilasters: 1 inch.
   6. Pilaster Height: 82 inches.

2.03 ACCESSORIES

A. Head Rails: Hollow heavy extruded aluminum tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.

B. Pilaster Brackets: Continuous extruded aluminum.

C. Wall Brackets: Continuous type, extruded aluminum.

D. Pilaster Shoes: Formed one piece plastic to match, 3 in high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

E. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.

F. Hardware: Heavy extruded aluminum:

1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
2. Nylon bearings.
3. Door Latch: Slide type with exterior emergency access feature.
4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
5. Coat hook with rubber bumper; one per compartment, mounted on door.
6. Provide door pull for outswinging doors.
7. All hardware to be aluminum or stainless steel.

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.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch.

B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2813
TOILET ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Toilet Room Accessories.

B. Utility Room Accessories.

1.02 RELATED SECTIONS

A. Section 10 2113 - Plastic Toilet Compartments.

1.03 REFERENCES

A. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board; 2010.

B. ASTM A 240/A 240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023.

C. ASTM A 554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2021.

D. ASTM C 1036 - Standard Specification for Flat Glass; 2021.

E. ASTM F 446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 2019 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's product data for products specified, indicating selected options and accessories.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum five (5) years of documented experience producing products of the types specified in this section.

B. Regulatory Requirements: Conform to ADAAG requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Factory-apply strippable protective vinyl coating to sight-exposed surfaces after finishing of products; ship products in manufacturer's standard protective packaging.

B. Storage and Protection: Store products in manufacturer's protective packaging until installation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's standard warranty against defects in product workmanship and materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bobrick Washroom Equipment, Los Angeles, California.

B. Bradley Corporation, Menomonee Falls, Wisconsin.

C. Gamco, Franklin Brass, Durant, OK.

D. Foundations Worldwide, Inc. Medina, Ohio.

2.02 MATERIALS

A. Stainless Steel Sheet: ASTM A 240/A 240M, Type 304, 18-8 alloy.

2.03 TOILET ACCESSORIES

A. Basic Construction Requirements:
   1. Doors: Fabricated from minimum 0.0313 inch stainless steel sheet, formed hems at sight-exposed edges; welded corners, finished to match sheet finish.
   2. Cabinets: Fabricated from minimum 0.0313 inch stainless steel sheet, formed hems at sight-exposed edges; all joints welded, sight-exposed welds finished to match sheet finish.
   3. Hinges: Stainless steel piano hinge, 3/16 inch diameter barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
   4. Locks: Tumbler locks, keyed alike other toilet accessory locks, with two keys for each lock.
   5. Stainless Steel Finish: No.4 satin.

B. Toilet Paper Holder: Model B-4288, Bobrick.

C. Automatic Soap Dispenser: Model B-8281, Bobrick.

D. Mop Holder: Model B-223 x 24"; Bobrick

E. Diaper Changing Table: Model KB300; Bobrick, Koala Kare.

F. Sanitary Napkin Disposal: Model B-270, Bobrick.

2.04 MIRRORS

A. Mirror: Model B-290; Bobrick
   1. Frame: Angle
   2. Mirror: Plate glass
   3. Size: As indicated on drawings
   4. Finish: No. 4 satin stainless steel

B. Angle Mirror Frames: Fabricated from 0.050 inch stainless steel, formed to 3/4 by 5/8 inch angle; heliarc-welded corners, finished to match sheet finish; concealed "H" type mounting bracket with tamper-proof fasteners.

C. Plate Glass Mirror: 1/4 inch thick polished plate glass, ASTM c 1036, Type I, Class 1, quality Q1 mirror select; silver-coated, hermetically sealed with uniform electrolytically-deposited copper plating.

2.05 GRAB BARS

A. Grab Bars - Basic Requirements: Fabricated to comply with ASTM F 446 and to withstand a 900 pound force, from ASTM A 554 stainless steel tubing, 0.050 inch, Type 304, 18-8 alloy; formed 1-1/2 inch radius return to wall at each end; each end heliarc-welded to minimum 11 gage stainless steel circular flange; welds finished to match tube finish.

B. Grab Bars: Series B-6806; Bobrick.
   1. Sizes and configurations: As indicated on drawings.

C. Grab Bar Concealed Mounting Flanges: Stainless steel, 3 inch diameter by 1/2 inch deep, with 0-0897 inch steel tenon plate for concealed attachment using three set screws.

D. Grab Bar snap-On Mounting Flanges: Snap on stainless steel cover, 0.0313 inch, 3 inch diameter by 1/2 inch deep, for concealing grab bar mounting flange.

2.09 ELECTRIC HAND DRYERS

A. Electric Hand Dryer: Excel Thin Air TA-ABS Surface Mount ADA Hand Dryer
   1. Finish: White Polymer (ABS)
   2. Mount: Surface
   3. Airspeed: 16,000 LFM
   4. Electrical: 110-120V

PART 3 EXECUTION

3.01 INSTALLATION

A. Install toilet accessories plumb and level in accordance with manufacturer's printed installation instructions.

B. Locate toilet accessories at heights specified by Americans with Disabilities Act (ADA).

3.02 CLEANING

A. Remove manufacturer's protective vinyl coating from sight-exposed surfaces 24 hours before final inspection.

B. Clean surfaces in accordance with manufacturer's recommendations.

3.03 PROTECTION OF INSTALLED PRODUCTS

A. Protect products from damage caused by subsequent construction activities.

B. Field repair damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.

3.04 SCHEDULE (Contractor shall verify quantities from plans)

A. Janitor 109

   a. 1 Mop Holder

B. Women 111

   a. 2 Mirrors, 24"x36" (MR-1)
   b. 1 Grab Bar, 42"x54" (L-Shaped) (GB-1)
   c. 1 Grab Bar, 18" Long (GB-2)
   d. 3 Toilet Paper Dispenser (TPD-1)
   e. 3 Sanitary Napkin Disposal (SND-1)
   f. 1 Soap Dispenser (SD-1)
   g. 1 Electric Hand Dryer (HD-1)
   h. 1 Fold Down Diaper Changing Table (DT-1)

C. Men 112

   a. 2 Mirrors, 24"x36" (MR-1)
   b. 1 Grab Bar, 42"x54" (L-Shaped) (GB-1)
   c. 1 Grab Bar, 18" Long (GB-2)
   d. 2 Toilet Paper Dispenser (TPD-1)
   e. 1 Soap Dispenser (SD-1)
   f. 1 Electric Hand Dryer (HD-1)
   g. 1 Fold Down Diaper Changing Table (DT-1)

END OF SECTION

SECTION 10 4116
EMERGENCY KEY CABINETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Emergency Key Cabinets

1.02 RELATED SECTIONS

A. Section 04 2000 – Unit Masonry

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Provide manufacturer's data and test results.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. KNOX Company, Phoenix, AZ; 3200 Series Knox-Box

2.02 PERFORMANCE

A. Holds up to 10 Keys and/or access cards in interior compartment

B. Lock: UL Listed. Double-action rotating tumblers and hardened steel pins accessed by a biased cut key.

C. Resists moist conditions with a weather resistant door

D. Exterior Dimensions: 4" H x 5" W x 3 3/4" D. Recessed mount flange: 7"H x 7"W

E. Color: To be selected by Architect.

F. Weight: 9 lbs.

G. Mounting: Recess Mount

2.03 MATERIALS

A. 1/4" Steel plate housing.

B. 1/2" thick steel door with interior gasket seal and stainless steel door hinge.

C. Lock to have 1/8" thick stainless steel dust cover with tamper seal mounting capability.

D. Lock: UL Listed. Double-action rotating tumblers and hardened steel pins accessed by biased cut key.

2.04 ACCESSORIES

A. Provide Recessed Mounting Kit (RMK)

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in stick accordance with manufacturer's printed instructions.

B. Install at location shown on the drawings.

3.02 SCHEDULE

A. Provide one (1) Knox-box cabinet with recessed mounting kit; as shown on the Drawings.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

1.03 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. 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.

2.02 FIRE EXTINGUISHERS

A. Dry Chemical Type: Painted steel tank, with pressure gage.
   1. Class: A, B, C.
   2. Size 10.
   3. Finish: Baked enamel.

2.03 FIRE EXTINGUISHER CABINETS

A. Metal: Formed factory painted steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
   1. Sized to accommodate accessories.
   2. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

D. Door Glazing: Clear, 3/16 inch thick acrylic. Set in resilient channel gasket glazing.

E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Factory painted.

H. Finish of Cabinet Interior: White enamel.

I. J.L. Industries: "Panorama" Model 1016, C70.

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, See drawings.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

E. Contractor is responsible for filling and servicing extinguishers ready for building occupancy.

3.03 SCHEDULES

A. Provide fire extinguishers and cabinets located on the drawings and shown as "F.E.C."

END OF SECTION

SECTION 10 7316
PRE-MANUFACTURED CANOPIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work in this section includes furnishing and installation of roll-formed aluminum overhead hanger rod style canopy.

1.02 SUBMITTALS

A. Section 01 3323 - Submittals, for submittal procedures

B. Supply manufacturer's standard literature and specifications for canopies.

C. Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

1.03 PERFORMANCE REQUIREMENTS

A. Canopy must conform to local building codes.

1.04 DELIVER, STORAGE, HANDLING

A. Deliver and store all canopy components in protected areas.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Mapes Canopies
   1. Lincoln, Nebraska
   2. Phone: 1-888-273-1132
   3. Fax: 1-877-455-6572

2.02 MATERIALS

A. Mapes, "Lumishade" with standard hanger rod configuration
   1. Decking shall consist of an interlocking roll-formed 2 ½ W style pan (minimum.032 aluminum.)
   2. Intermediate framing members shall be extruded aluminum, alloy 6063-T6.
   3. Hanger rods and attachment hardware shall be powder coated.
   4. Fascia shall be premium 8" extruded J3 style (minimum.125 aluminum.)
   5. Provide intermediate outrigger support as required where hanger rod support spacing exceeds manufacturers' recommended spacing.
   6. Square escutcheon attached to metal wall panel.

2.03 FINISHES

A. Color: Chosen from standard two-coat Kynar colors.

2.04 FABRICATION

A. Canopy to be shipped in preassembled sections for ease of installation.

B. All connections shall be mechanically assembled utilizing 3/16 fasteners with a minimum shear stress of 350 lb. Pre-welded connections are not acceptable.

C. Decking shall be designed with interlocking roll-formed aluminum members.

D. Concealed drainage. Water shall drain from covered surfaces into intermediate trough and be directed to the front for front drainage.

PART 3 EXECUTION

3.01 INSPECTION

A. Confirm that surrounding area is ready for the canopy installation.

B. Installer shall confirm dimensions and elevations to be as shown on drawings provided by manufacturer.

C. Erection shall be performed by an approved installer and scheduled after all concrete, masonry, and roofing in the area is completed.

3.02 INSTALLATION

A. Installation shall be in strict accordance with manufacturer's shop drawings. Particular attention should be given to protecting the finish during handling and erection.

B. Connection of canopy hanger rod to be fastened to concrete block back-up.

C. After installation, entire system shall be left in a clean condition.

END OF SECTION

DIVISION 11

EQUIPMENT

SECTION 11 3100
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

1.02 REFERENCES

A. UL (EAUED) - Electrical Appliance and Utilization Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owners name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Electric Appliances: Listed and labeled by UL and complying with NEMA standards.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Refrigerator: Free standing, side by side
   1. Capacity: 24.8 cubic feet
   2. Features:
      a. Water filter.
      b. Crushed & cubed ice, water dispenser
      c. Humidity controlled crisper
      d. 3 refrigerator drawers
      e. 3 adjustable shelves
      f. 4 refrigerator door bins
      g. Gallon door storage
   3. Energy Star Compliant
   4. Frost free appliance
   5. Finish: Stainless Steel
   6. Manufacturer: Kenmore Model No. 51763

B. Range: Drop-In, Electric Range
   1. 30 inch wide drop-in range
   2. ADA compliant front controls
   3. Cooktop: Gray Patterened Ceramic Glass
      a. Right Front: 9"/6" – 3000 watts Power Boil
      b. Right Rear: 6" - 1,200 watts
      c. Left Front: 8" - 2,000 watts
      d. Left Rear: 8" - 2,000 watts
   4. Oven Capacity: 4.4
   5. Self-Cleaning Oven

6. Glass Oven Door
7. Finish: Stainless Steel
8. Manufacturer: GE Model No. JD630SFSS

C. Range Hood: Vented Range Hoods
1. 300 CFM centrifugal blower with three-speed electronic touch controls
2. Vented; 7 inch round
3. Auto heat sensor; automatically turns blower to high speed when excess heat detected.
4. Quiet operation: 4.5 sones at high speed
5. Finish: Stainless Steel
6. Manufacturer: Kenmore Model No. 22-55023

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are present and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING

A. Adjust operating equipment to efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment.

B. Wash and clean equipment.

3.05 SCHEDULE

A. Breakroom 114
1. 1 side by side refrigerator
2. 1 Drop-In Range
3. 1 Range Hood

END OF SECTION

DIVISION 31

EARTH WORK

SECTION 31 1000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 01 1100 - Summary: Limitations on contractor's use of site and premises.

B. Section 01 1100 - Summary: Sequencing and staging requirements.

C. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 5713 - Temporary Erosion and Sediment Control.

E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

F. Section 01 5719 - Environment Protection: Limitations on disposal of removed materials.

G. Section 02 4100 - Demolition

H. Section 31 2200 - Grading: Topsoil removal.

I. Section 31 2200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

J. Section 31 2323 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 PROJECT CONDITIONS

A. The contractor is to visit the site to examine and thoroughly familiarize himself with the existing conditions before submitting his bid.

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.

C. Comply with other requirements specified in Section 01 7000.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 7000.

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. Do not disrupt utilities to the owner's existing facilities without scheduling and coordinating with the owner and architect.

E. 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, lawns, and planting beds.

B. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.

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 2200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 1000 - Site Clearing.

B. Section 31 2316 - Excavation.

C. Section 31 2323 - Fill: Filling and compaction.

1.03 PROJECT CONDITIONS

A. Protect above- and below-grade utilities that remain.

B. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil:
   1. Topsoil brought onto site must meet the following requirements; source of topsoil subject to architect's approval.
   2. Graded.
   3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

B. Other Fill Materials: See Section 31 2323.

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. Protect from damage above- and below-grade utilities to remain.

3.03 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or regraded, without mixing with foreign materials.
   1. Do not remove topsoil or subsoil when wet.
   2. Remove topsoil to a maximum depth of 10 inches.

B. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

C. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill. **Contractor is responsible for temporary stabilization for grading prior to placement of grass seed or sod.**

3.04 SOIL REMOVAL AND STOCKPILING

A. Stockpile topsoil to be re-used on site; remove remainder from site

B. Stockpiles: Use areas on site that will not interfere with construction operations.
   1. Pile depth not to exceed 8 feet.
   2. 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 6 inches.

D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 6 inches.

E. Place topsoil in areas where seeding, sodding, and planting are indicated.

F. Place topsoil where required to level finish grade.

G. Place topsoil to nominal depth of minimum of 6 inches.

H. Place topsoil to the following compacted thicknesses:
   1. Areas to be sodded: 6 inches below finish grade.
   2. Planting beds: 18 inches below finish grade.
   3. Planter boxes: 18 inches to within 3 inches of rim.

I. Place topsoil during dry weather.

J. Remove roots, weeds, rocks, and foreign material while spreading.

K. Near plants and buildings spread topsoil manually to prevent damage.

L. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

M. 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).

C. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.

D. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 31 2323 for compaction density testing.

3.08 CLEANING

A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS

A. Section 01 5713: Erosion control.

B. Section 31 2200 - Grading: Grading.

C. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 PROJECT CONDITIONS

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Protect plants, lawns, and other features to remain.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

3.02 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Slope banks of excavations deeper than 4 feet to no greater than the angle of repose or unless shored to meet OSHA Requirements.

D. Do not interfere with 45 degree bearing splay of foundations.

E. Cut utility trenches wide enough to allow inspection of installed utilities.

F. Hand trim excavations. Remove loose matter.

G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation.

I. Remove excavated material that is unsuitable for re-use from site.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural fill for building pad.

B. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, site structures, and utilities within the building.

C. Backfilling and compacting for utilities outside the building to utility main connections.

D. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 00 3100: Available project information.

B. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

C. Section 31 2200 - Grading: Site grading.

1.03 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2009

B. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2006.

C. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)) 2007.

D. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2007.

E. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2006.

F. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)/; 2005.

G. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

1.04 DEFINITIONS

A. Finish Grade Elevations: indicated on drawings.

B. Subgrade Elevations: 6 inches below finish grade elevations indicated on drawings unless otherwise indicated.

1.05 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.06 DELIVERY STORAGE AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the work are as indicated.

1.07 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.

1.08 QUALITY CONTROL

A. Contractors responsible for placing fill material must be familiar with the geotechnical report included in Section 00 3100 of these specifications.

B. The geotechnical engineer must approve quality and source of all fill material.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D 2487 Group Symbol GC, SC, CL, GP, GM AND SM.
   4. May be soil removed from excavations.
   5. Alternate material if approved by architect.

B. Structural Fill: Imported borrow.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D 2487 Group Symbol GC, SC, CL.
      a. Liquid limit no greater than 45; ASTM D 4318.
      b. Plasticity index less than 25; ASTM D 4318.
   4. Alternate material if approved by the geotechnical engineer and the architect.
   5. Do not use soils excavated on site for structural fill.
   6. Conforming to ASTM D2487 Group Symbol CL.
      a. Dry density of 115.0 pcf.
      b. Plasticity index between 5 and 20; ASTM D4318.

C. Concrete for Fill: As specified in Section 03 3000; compressive strength of 2500 psi.

D. Granular Fill - Fill Type AHTD Class 7: Angular crushed washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with AASHTO T 11 and T 27, within the following limits:
      a. 1-1/2 inch sieve: 100 percent passing.
      b. 3/4 inch sieve: 50 to 90 percent passing
      c. No. 4 sieve: 25 to 55 percent passing
      d. No. 40: 10 to 30 percent passing
      e. No. 200: 3 to 10 percent passing.

E. Granular Fill - Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Grade in accordance with ASTM D 2487 Group Symbol SW.
   2. Washed masonry sand with no more than 10% fines may be used.

F. Topsoil: See Section 31 2200.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - 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. Identify required lines, levels, contours, and datum locations.

B. See Section 31 2200 for additional requirements.

C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

D. Verify structural ability of unsupported walls to support imposed loads by the fill.

E. Verify that survey bench marks and intended elevations for the Work are as indicated.

3.02 PREPARATION

A. Strip topsoil and stock pile as directed.

B. Proof roll with loaded tandem axle truck or equivalent to identify soft spots.
   1. Any soft spots identified will be undercut as directed by the architect/geotechnical engineer. Costs for any undercut will be by change order and is not included in base bid.
   2. At the direction of the architect/geotechnical engineer, cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill if within limits of building or paving; general fill for other site areas. Costs for cutting out soft areas will be by change order and is not included in the base bid.
   3. No undercut is to be completed without prior approval of architect.

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 material.

B. Fill to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain moisture content of fill materials to attain required compaction density as specified in the geotechnical report.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2.4 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Fill with concrete or flowable fill.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density within a water content above optimum; ASTM D-1557 modified proctor..

J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving and slabs-on-grade: 95 percent of maximum dry density within a water content range above optimum; ASTM D-1557 modified proctor.
   2. At other locations: 92 percent of maximum dry density within a water content range above optimum; ASTM D 1557 modified proctor.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill at all areas to be covered by paving and area to be covered by building:
   1. Fill to subgrade elevations.
   2. Maximum depth per lift: 6 inches, compacted.
   3. Compact to minimum 95 percent of maximum dry density within a water content range above optimum; ASTM D1557 modified proctor.

C. Under Interior Slabs-On-Grade:
   1. Use granular fill.
   2. Depth: 4 inches deep.

D. At Foundation Walls:
   1. Use general fill.
   2. Fill to subgrade elevation.
   3. Compact each lift to 95 percent of maximum dry density within a water content range above optimum; ASTM D1557 modified proctor..
   4. Do not backfill against unsupported foundation walls.
   5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

E. Over Buried Utility Piping and Conduits in Trenches:
   1. Bedding: Use granular fill or sand.
   2. Cover with general fill.
   3. Fill to subgrade elevation.
   4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

F. At Lawn Areas:
   1. Use general fill.
   2. Fill to 6 inches below finish grade elevations.
   3. Compact to 90 percent of maximum dry density within a water content range above optimum; ASTM D1557 modified proctor..
   4. See Section 31 2200 for topsoil placement.

G. At over-excavated footings:
   1. Use concrete fill or flowable fill.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

C. Top Surface of Filling under Floor Slabs: +/- 1/8 inch from required elevation.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests:
   1. Tests shall be made every day fill is being placed and representative lifts tested.
   2. At least one test per 2,500 sq. ft. under buildings and structural areas.

3. At least one test per 5,000 sq. ft. under paved areas.
4. At least one test per 10,000 sq. ft. in general areas.
5. Contractor shall notify architect when fill work is in progress.
6. Test locations will be selected at random by architect with an effort made to select areas of questionable compaction.

F. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.07 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 31 3116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 REFERENCE STANDARDS

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 2001).

B. Arkansas State Plant Board Requirements.

1.03 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Warranty: Submit warranty and ensure that forms have been completed in The Owners name.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work.
   1. Approved by manufacturer of treatment materials.
   2. Licensed in the State of Arkansas.

1.05 SEQUENCING

A. Apply toxicant 12 hours prior to installation of vapor barrier under slabs-on-grade.

1.06 WARRANTY

A. See Section 01 7800 - 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 the 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 extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

D. Re-treat disturbed treated soil with same toxicant as original treatment.

E. 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

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 1123
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

1.02 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for base course.

B. Section 31 2323 - Fill: Compacted fill under base course.

C. Section 32 1313 - Concrete Paving: Finish concrete surface course.

D. Section 31 2323 - Fill: Topsoil fill at areas adjacent to aggregate base course.

1.03 REFERENCE STANDARDS

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; American Association of State Highway and Transportation Officials; 1965 (2004).

B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials; 2010

C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2006.

D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)); 2012.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

G. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2004.

H. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

I. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

J. Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Dept., Edition 2003

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Samples: 10 lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.

C. Materials Sources: Submit name of imported materials source.

D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

E. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate stockpiles where indicated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse Aggregate Type Arkansas Highway and Transportation Department Sec. 303, Class 7: Angular crushed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM D2487 Group Symbol GW.
   2. Graded in accordance with ASTM C136, within the following limits:
      a. 1-1/2 inch sieve: 100 percent passing.
      b. 3/4 inch sieve: 50 to 90 percent passing.
      c. No. 4 sieve: 25 to 55 percent passing.
      d. No. 40: 10 to 30 percent passing.
      e. No. 200: 3 to 10 percent passing.

2.02 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

B. Place aggregate in maximum 7 inch layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, aerate to reduce moisture content and remove if determined necessary by architect.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

3.05 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted aggregate base course in accordance with ASTM D2922 and ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests:
   1. Tests shall be made every day aggregate is being placed and representative lifts tested.
   2. At least one test per lift per 5,000 sq. ft.
   3. Contractor shall notify architect when aggregate work is in progress.

4. Test locations will be selected at random by architect with an effort made to select areas of questionable compaction.

3.06 CLEANING

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 1313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, integral curbs, gutters, and Accessories.

B. Curb cuts and drainage structures.

C. Concrete paving at mechanical pads.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 2200 - Grading: Preparation of site for paving and preparation of subsoil at pavement perimeter for planting.

C. Section 31 2323 - Fill: Compacted subbase for paving.

D. Section 32 1123 - Aggregate Base Courses: Base course.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).

B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.

C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.

D. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.

E. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.

F. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

G. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete; 2007.

H. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2012.

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2012.

L. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.

M. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2010b.

N. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

O. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

P. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2011.

Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Obtain cementitious materials from same source throughout.

C. Follow recommendations of ACI 305R when concreting during hot weather.

D. Follow recommendations of ACI 306R when concreting during cold weather.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: Conform to ACI 301.

B. Wood or steel form material, profiled to suit conditions.

C. Joint Filler: Preformed; non-extruding bituminous type (ASTM D 1751).
   1. Thickness: 1/2 inch.

D. Curb machine/slip form to detailed profile must be used for curbs and gutters.

2.02 REINFORCEMENT

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 03 2000.

B. Reinforcing Steel: ASTM A615/A615M Grade 40 (280); deformed billet steel bars; unfinished finish.

C. Steel Welded Wire Reinforcement: Plain type, ASTM A 185/A 185M; in coiled rolls; unfinished.

D. Dowels: ASTM A615/A615M Grade 40 (280); deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

A. Concrete Materials: As specified in Section 03 3000.

B. Cement: ASTM C150/C150M Normal - Type I portland type, grey color.

C. Fine and Coarse Mix Aggregates: ASTM C33.

D. Fly Ash: ASTM C618, Class C.

E. Water: Clean, and not detrimental to concrete.

F. Air Entrainment Admixture: ASTM C260.

2.04 ACCESSORIES

A. Curing Compound: ASTM C 309, Type 1, Class A.

2.05 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 for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
   1. Admixtures may only be added upon approval of architect.

D. Concrete Properties:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 psi.
   2. Fly Ash Content: Maximum 20 percent of cementitious materials by weight.
   3. Water-Cement Ratio: Maximum 35 percent by weight for concrete with air.

4. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
5. Maximum Slump: 6 inches.

2.06 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 SUBBASE

A. See Section 32 1123 for construction of base course for work of this Section.

3.03 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole, catch basin, and drainage structure frames with oil to prevent bond with concrete paving.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 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.

3.05 REINFORCEMENT

A. Place reinforcement at midheight of slabs-on-grade.
   1. Use reinforcement only where detailed on drawings.

B. Place reinforcement as indicated.

C. Interrupt reinforcement at contraction and expansion joints.

D. Place dowels or reinforcement to achieve pavement and curb alignment as detailed.

3.06 PLACING CONCRETE

A. Place concrete as specified in Section 03 3000.

B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

C. Place concrete continuously over the full width of the panel and between predetermined construction joints.

3.07 JOINTS

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components.
   1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.
   2. Secure to resist movement by wet concrete.

C. Provide scored or sawn joints:
   1. At 6 feet intervals.
   2. Between sidewalks and curbs.

D. Provide keyed joints as indicated.

E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 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 parallel to pavement direction.

D. See drawings and specifications Section 32 1726 for Tactile Warning Surfaces.

3.09 JOINT SEALING

A. See Section 07 9005 for joint sealer requirements.

3.10 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000.
   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 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 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.

3.12 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

SECTION 32 9213

HYDROMULCHING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Seeding and fertilizing by the hydromulching method finish-graded slopes and areas disturbed by construction work.

1.02 RELATED WORK

A. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

B. Section 31 2323 – Fill: Topsoil Material

1.03 REFERENCES

A. Federal Specifications (FS):

1. FS-O-F-241 – Fertilizers, Mixed, Commercial.

1.04 QUALITY ASSURANCE

A. Furnish seed labeled in accordance with current rules and regulations of Arkansas Plant board.

1.05 SUBMITTALS

A. Submit results of soil analysis of samples taken from seeding area and/or imported topsoils.

B. Submit labels from seed bags, lime and fertilizers.

C. Submit sample of mulching material.

D. Submit soil stabilizer information.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver grass seed in original containers showing analysis of seed mixture, percentage or pure seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable.

B. Deliver fertilizer and lime in waterproof bags showing new weight, chemical analysis, and name of manufacturer.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil: Use topsoil excavated from the site only if conforming to the specified requirements.

1. Existing Topsoil: Natural, fertile agricultural soil capable of sustaining vigorous plant growth, not frozen or muddy condition, containing not less than 3% organic matter, and corrected to PH valve of 5.9 to 7.0. Free from sub-soil, slag, clay, stone, lumps, live plants, roots, sticks, crabgrass, coughgrass, noxious weeds, and foreign matter.

2. Imported Topsoil: Natural, fertile agricultural soil typical of locality, capable of sustaining vigorous plant growth, from well-drained site free of flooding, not frozen or muddy condition, not less than 3% organic matter, and PH value of 5.9 to 7.0. Free from subsoil, slag, clay, stones, lumps, live plants, roots, sticks, crabgrass, coughgrass, noxious weeds, and foreign matter.

3. Have topsoils analyzed and submit written analysis stating the nitrogen, phosphorous, and potassium requirements, organic matter content, and ph value of the soil.

4. Incorporate 15% compost by volume into existing and/or imported topsoil prior to planting or backfill mix preparation.

B. Fertilizers: FS O-F-241 commercial type:

1. Proportions: 10N-20P-10K

C. Lime: Lime if required, shall be agricultural grade ground limestone ground to pass an 8-meshed sieve with 25 percent passing a 100-meshing sieve. Calcareous limestone shall contain not less than 50 percent calcium oxide, and dolomitic limestone shall contain not less than 40 percent magnesium oxide. Coarser materials will be accepted provided the specified rates of application are increased proportionality; on the basis of quantities passing the 8 and 100 mesh sieves, but no additional payment will be made for the increase quantity.

D. Seed, General:

1. Labeled in accordance with current rules and regulations of Arkansas State Plant Board.
2. Minimum 98% pure seed and 85% germination by weight.
3. Allowable noxious weed seeds: 50 per pound of seed with no Johnson grass, wild onion, wild garlic, field bindweed, or nut grass seed allowed in any amount whatsoever.
4. Furnish seed in sealed, standard containers.

E. Seed Varieties: Refer to seed mix control schedule in subsection 2.2 – A of this section.

F. Mulching material/soil stabilizer:

1. Virgin wood cellulose fiber combined with COHEREX, as manufactured by Witco Chemical, Golden Bear Division, Bakersfield, CA or
2. CONWED 2000, as manufactured by Conwed Corporation, Environmental Products Division, St Paul, MN.

2.02 MIXING

A. Seed Mix: Seed shall be composed of the varieties and amount by weight as shown below.

1. Turf Type Seeding 60 lbs/Acre
   a. Common Bermudagrass –Hulled (Cynodon dactylon)

B. Hydromulching Mixture:

1. 2000 lbs. of virgin wood cellulose fiber per acre: COHEREX in proportion as recommended by manufacturer for mixing with cellulose fiber.
2. Fertilizer: Minimum 600 lbs. per acre.
3. CONWED 2000 in proportion to rest of mixture as recommended by manufacturer.
4. Seed: As specified for type of seed or seed mixture and time of application.
5. Water.

PART 3 - EXECUTION

3.01 PREPARATION

A. Have the seeding areas tested for lime and fertilizer requirements by the County Extension Agent, other public service agency, or private testing service at Contractor's expense. At least three soil samples shall be taken from each area. Submit a report of the soil analysis and recommendation to the Architect/Engineer.

B. Verify that seeding area has been cleaned up and dressed to final shape.

3.02 INSTALLATION

A. Subgrade Preparation:

1. Fine grade sub-grade, eliminating uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas and rake until smooth.
2. Remove foreign materials, undesirable plants and their roots, stones and debris. Do not bury foreign material beneath areas to be hydromulched.

3. Remove subsoil which has been contaminated with petroleum products.
4. Scarify and pulverizing sub-soil to a depth of 3 inches where topsoil is to be placed. Repeat pulverizing in areas where equipment used for hauling and spreading topsoil has compacted subsoil.
5. If lime is required, apply at rate determined by soil analysis, uniformly spreading on areas prior to their being scarified. Thoroughly mix lime with sub –soil to the scarified depth.

B. PLACING TOPSOIL:

1. Spread topsoil to the minimum depth stated on the drawings over all areas to be seeded.
2. Place topsoil during dry weather and on dry, unfrozen subgrade.
3. Remove stones, roots, grass weeds, debris, and other foreign non-organic material while spreading.
4. If lime is required, apply at rate determined by soil analysis, uniformly spreading on topsoiled areas. Thoroughly mix lime with topsoil layer.

C. Hydromulching:

1. Prior to hydromulching, lightly firm seeding areas with a cultipacker.
2. Verify that seeding area is ready to receive hydromulching and notify architect/engineer of schedule for application.
3. Apply mixture of mulch, seed, fertilizer, soil stabilizer, and water with the proper equipment to achieve complete coverage at the specified rate.

3.03 MAINTENANCE

A. Maintain hydromulching areas by watering, fertilizing, reseeding, and repairing as necessary for a period of 30 days after germination, to provide a healthly, growing stand of grass. Water seeded areas to maintain adequate moisture levels for vigorous germination and growth. Apply additional granular or liquid fertilizer 30 days after germination.

B. Mow turf grass areas to a height of 3 to 4 inches when height of grass reaches 6 inches. Mowing is not required in areas designated for erosion control seeding.

C. Repair and reseed damaged ground surfaces outside of normal work areas due to negligence of the Contractor.

D. It is intended that an established live and growing stand of grass be provided with no bare spots. The contractor shall re-seed areas as necessary to obtain this result.

E. The time required for maintenance after the Contract Time ends will not be assessed as liquidated damages provided all other work under the contract has been completed.

END OF SECTION

SECTION 21 0500

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

D. Pipe hangers and supports.

E. Pipe sleeves.

1.02 REFERENCE STANDARDS

A. ASME A112.18.1 - Plumbing Supply Fittings; 2012.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications; 2015.

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.

D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2011.

E. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2013.

F. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2011.

G. ASME B16.25 - Buttwelding Ends; 2012.

H. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2015.

I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999 (Reapproved 2014).

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.

K. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).

L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2015.

M. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013.

N. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

O. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

P. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Project Record Documents: Record actual locations of components and tag numbering.

D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.04 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 3 years experience. approved by manufacturer.

C. Conform to UL, FM, and Warnock Hersey requirements.

D. Valves: Bear UL, FM, and Warnock Hersey 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.

1.05 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.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System :
   1. Comply with NFPA 13.
   2. See Section 21 1300.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10, ASME B36.10M Schedule 5, ASTM A53 Schedule 40, ASTM A135/A135M Schedule 10, ASTM A135/A135M UL listed light wall type, or ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.9, wrought steel, buttwelded, ASME B16.25, buttweld ends, 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. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   4. 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.

2.03 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch above finished floor.
   2. Provide sealant for watertight joint.

B. Clearances:
   1. Provide allowance for insulated piping.
   2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
   3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.04 ESCUTCHEONS

A. Material:
   1. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:

1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

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, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

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. Sleeve pipes passing through partitions, walls, and floors.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. 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.

H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

I. 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.

J. Do not penetrate building structural members unless indicated.

K. Provide sleeves when penetrating footings, floors, walls, and partitions and seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.

L. 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.

M. Install valves with stems upright or horizontal, not inverted. remove protective coatings prior to installation.

N. Provide drain valves at main shut-off valves, low points of piping and apparatus.

END OF SECTION 21 0500

SECTION 21 0548

VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Seismic restraint systems

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Provide manufacturer's product literature documenting compliance with specified requirements.
   2. Include seismic rating documentation for each restraint component accounting for horizontal, vertical, and combined loads.

C. Shop Drawings:
   1. Provide schedule of vibration isolator type with location and load on each.
   2. Include selections from prescriptive design tables that indicate compliance with the applicable building code.
   3. Clearly indicate the load and capacity assumptions selected. Include copies of any calculations.
   4. Include the calculations that indicate compliance with the applicable building code for seismic controls and the manufacturer's requirements.

D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.03 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Perform design and installation in accordance with applicable codes.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. General:
   1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.

2.02 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

C. Cable Restraints:
   1. Comply with ASCE 19.
   2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
   3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
   4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

E. Products to be listed in accordance with the requirements of NFPA 13.

F. Cable Restraints:
   1. Wire Rope: Steel wire strand cables sized to resist seismic loads in lateral directions.
   2. Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.
   3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
   4. Connections:
      a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
      b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
   5. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

G. Rigid Restraints:
   1. Structural Element: Sized to resist seismic loads in lateral directions and carry both compressive and tensile loading.
   2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
   3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
   4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
   5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

3.02 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. Comply with the requirements of NFPA 13.

3.03 INSTALLATION - SEISMIC

A. Comply with the following:
   1. Install in accordance with manufacturer's instructions.
   2. Comply with the requirements of ASCE 7, FEMA E-74, and NFPA 13.

B. Piping:
   1. Provide seismic bracing.
   2. Provide supports, braces, and anchors to resist gravity and seismic design forces.
   3. Brace every run 5.0 feet or more in length with two transverse and one longitudinal bracing locations.
   4. Pipes and Connections Constructed of Ductile Materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections):
      a. Provide transverse bracing at spacing not more than 40.0 feet on center.

b. Provide longitudinal bracing at spacing not more than 80.0 feet on center.

5. Pipes and Connections Constructed of Non Ductile Materials (listed plastic pipe):
   a. Provide transverse bracing at spacing not more than 20.0 feet on center.
   b. Provide longitudinal bracing at spacing not more than 40.0 feet on center.
6. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.
7. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

END OF SECTION 21 0548

SECTION 21 1300

FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.02 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; current edition.

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; 2016.

C. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.03 SUBMITTALS

A. 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.

B. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect/Engineer.

C. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

1.04 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Comply with 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 in which the Project is located.

D. Equipment and Components: Provide products that bear FM (AG) label or marking.

E. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.05 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 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.

2.02 SPRINKLERS

A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Brass.

4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

B. Exposed Area Type: Pendant upright type with guard.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Brass.

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. 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/#sle.

2.03 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:

B. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, water flow switch and electric alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.

C. Backflow Preventer: Reduced pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

D. Test Connections:

E. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

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. Place pipe runs to minimize obstruction to other work.

D. Place piping in concealed spaces above finished ceilings.

E. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

F. 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.

G. Flush entire piping system of foreign matter.

H. Hydrostatically test entire system.

I. Require test be witnessed by Fire Marshal.

END OF SECTION 21 1300

SECTION 23 0200
HVAC GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 CONDITIONS OF THE CONTRACT

A. The Conditions of the Contract (General, Supplementary, and other Conditions) and the General Requirements are hereby made a part of this Section.

B. This Section is a Division 23 0000 Basic Materials and Methods Section and is a part of each Division 23 Section.

C. The Contractor shall be responsible for construction coordination of all work described in this section with the work specified in other sections of the specifications and shown on the drawings. In advance of construction, coordinate and work out any minor problems with other trades to avoid conflicts therewith. However, if other minor problems are encountered, bring these problems to the attention of the Architect, who will make the final decisions as to correction.

1. All references and notations pertaining to coordination by the Contractor shall apply to construction coordination. The Architect and Engineers have, to the best of their ability, coordinated the drawing and specifications to avoid conflicts between specified equipment and space required for such, and between architectural and engineering disciplines.
2. If substituted equipment (approved-equal) is to be used, the Contractor shall revise the 1/8” = 1'-0” & 1/4” = 1'-0” scale floor plans shown on the Drawings, indicating to scale, the equipment to be used. The purpose of these revised scale plans is to identify any problems with substituted equipment, and access and clearance requirements are maintained. These revised scale plans are to be submitted with the substituted equipment submittals.

1.02 WORK INCLUDED

A. This section consists of General Requirements and Standard Specifications covering certain parts of work under Division 23 0000 and is supplemented by other Division 23 sections covering additional work, requirements, and materials specifically applicable to the work of each section.

1.03 CODE AND REGULATORY AGENCY COMPLIANCE

A. This section consists of General Requirements and Standard Specifications covering certain parts of work under Division 23 0000 and is supplemented by other Division 23 sections covering additional work, requirements, and materials specifically applicable to the work of each section.

1. Occupational Safety and Health Administration.
2. Arkansas Mechanical Code, 2021 Edition.
3. Architectural Barriers Act of 1968: Public Law 90-480.
4. ICC/ANSI-A117.1.
5. NFPA 1 Fire Code.
6. National Fire Protection Association 101, Life Safety Code.
7. ADA Code.
8. Other applicable state and local laws and codes.

1.04 QUALITY ASSURANCE

A. Manufacturers: Only firms regularly engaged in manufacturing of the HVAC services, equipment and specialties of types and sizes required, whose products have been in satisfactory use in similar service shall be used on this project.

B. Installers Qualifications: Only firms with successful installation experience on projects with work similar to that required for this project shall perform work on this project.

1.05 SUBMITTALS

A. Provide six copies of each type of equipment material or information for installation.

B. Substitutions and/or systems designed and manufactured by other manufacturers will be considered under the terms described for substitutions with the following exceptions:
   1. Substitutions: See Section 01 6000 - Product Requirements.
   2. Substitution requests will be considered only if received at least 10 days prior to the bid date.
   3. Substitution requests will be considered only if required submittal data is complete.
   4. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design.
   5. Contractor or HVAC subcontractor shall certify that the substitute system will achieve the performance specified.

1.06 SITE EXAMINATION

A. Examine site, verify dimensions and locations against Drawings, and inform self of conditions under which work is to be done before submitting proposal. No allowance will be made for extra expense on account of error.

B. Information shown relative to existing services is based upon available records and data but is approximate only. Make minor deviations found necessary to conform with actual locations and conditions without extra cost. Verify location and elevation of utilities prior to commencement of excavation for new piping or its installation.

1.07 PLACEMENT OF EQUIPMENT AND WORK

A. The placement of substituted (approved equal) equipment and specified equipment in the locations shown on the drawings shall be the Contractors responsibility. The Contractor shall verify that all substituted and specified equipment will fit, operate, and have clearances and accessibility for maintenance, inspections, and operation within the space shown on the drawings. If the Contractor determines that substituted equipment or specified equipment will not fit and/or operate within the space shown on the Drawings and/or clearances and accessibility cannot be achieved, the contractor shall bring these problems to the attention of the Architect who will make the final decision as to the method of correction. Corrections to work already completed and in-place shall not constitute an increase in the contract amount. The Contractor shall be responsible and incur any cost to allow for the manufacturer's recommended or the code required clearance on all sides of equipment.

B. Move equipment and/or work into spaces through openings provided or located in the spaces during construction, as required.

C. Do disassembling and reassembling of equipment or other work necessary to accomplish this requirement without extra cost to the Owner. Do not disassemble or reassemble any equipment more than is intended by the equipment manufacturer in order to locate it in the space.

D. All ductwork exposed to view in finished spaces shall have a primed and painted sheet metal exterior finish. If the duct isscheduled to have exterior insulation the contractor shall install a continuous sheet metal wrap around the insulation or provide double-wall insulated spiral duct.

1.08 MATERIAL LIST AND SUBSTITUTIONS

A. Comply with Supplementary General Conditions.

1.09 MAINTENANCE AND OPERATING INSTRUCTIONS

A. Incorporate complete operating instructions including starting, stopping, and description of emergency manual operation methods for the following:
   1. Heating Systems
   2. Ventilating Systems
   3. Air Conditioning Systems

4. Provide charts and diagrams as required.
5. Provide operating manual for any equipment listed in individual sections of the specifications.

B. Provide maintenance instructions for each item of individual equipment covering pertinent maintenance data, such as lubricants to be used, frequency of lubrications, inspections required, adjustments, belt and pulley sizes, etc.

C. Provide parts bulletins containing manufacturer's bulletins with parts numbers, instructions, etc., for each item of equipment. Strip bulletins so that useless bulk is avoided.

D. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Mention herein or on Drawings requires that this Contractor provide each item listed of quality noted or acceptable equal. All material shall be new, full weight, standard in all respects, and in first-class condition. Provide materials of the same brand of manufacture throughout for each class of material or equipment where possible. Materials shall be tested within the Continental United States by independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements.

B. The grade or quality of materials desired is indicated by the trade names or catalog numbers stated herein. The catalog numbers and specification are for bidding purposes only. Actual equipment submitted and ordered shall be verified to be appropriate for indicated use.

C. Dimensions, sizes, and capacities shown are a minimum and shall not be changed without permissions of the Architect/Engineer.

2.02 MATERIALS FURNISHED

A. Identify all materials and equipment by manufacturer's name and model number. Remove unidentified materials and equipment from site.

B. Equipment specified by manufacturer's number shall include all accessories, controls, etc., listed in catalog as standard with equipment. Furnish optional or additional accessories as specified.

C. Equipment or material damaged during transportation, installation, or operation is considered as totally damaged. Replace with new equipment. Variance for this permitted only with written consent.

2.03 TEMPORARY HEATING, VENTILATING, AND AIR CONDITIONING

A. The general contractor shall provide, maintain and pay for all temporary ventilation of enclosed work areas to cure materials, disperse humidity, remove fumes, and to prevent accumulation of dust, irritants, or gases.

B. It is the responsibility of the general contractor to maintain manufacturer required levels of room and/or space temperature, humidity and ventilation necessary to install products, materials and/or systems of the work.

C. The general contractor shall remove, extend and/or relocate temporary heating and ventilating systems as rapidly as required in order to provide for progress of the Work.

D. The permanent HVAC system will not be allowed to be operated until construction has reached Substantial Completion and dust generating work is completed.

PART 3 - EXECUTION

3.01 DRAWINGS AND COORDINATION

A. General arrangement and location of piping, ductwork, equipment, etc., are shown on Drawings or herein specified. Carefully examine other work that may conflict with this work. Install this work in harmony with other crafts and at proper time to avoid delay of work.

B. In advance of construction, work out minor changes and relocations to suit actual conditions and work of other trades to avoid conflict therewith. Any change in rerouting ductwork, piping and equipment shall not be cause for additional cost.

C. The Sub-Contractor shall not fabricate ductwork off-site prior to field verification of actual conditions. Any changes and corrections required shall be done at the Contractor's expense.

D. The Sub-Contractor shall verify that the measurement of constructed rooms, spaces and areas are as shown on the Drawings. Any measurement deviation and/or discrepancies shall be brought to the attention of the Architect who will make the final decision as to the method of correction. Corrections to work already completed and in place shall be done at the Contractor's expense.

E. In addition, obtain all necessary information from the other trades regarding centers of partitions, wall, location of plumbing mains, fire sprinkler mains, and electrical conduits, ducts, pipes, etc., in order that pipes equipment, and ductwork may be placed in their correct positions.

F. Execute any work or apparatus shown on the Drawings and not mentioned in the specifications, or vice versa, the same as if specifically mentioned by both. Omission from Drawings or specifications of any minor details of construction, installation, materials or essential specialties does not relieve this contractor from furnishing same in place complete.

G. Furnish and install any incidental work not shown or specified which can reasonably be inferred as part of the work and necessary to provide a complete and workable system.

H. Furnish materials and work at proper time to avoid delay of the work.

3.02 CLOSING IN OF UNINSPECTED WORK

A. Do not allow or cause work installed to be covered up or enclosed before it has been inspected and tested. Should work be enclosed or covered up before it has been inspected and tested, Contractor shall uncover work at own expense. After it has been inspected and tested, make repairs necessary, to restore work of other Contractor's to condition in which it was found at time of cutting.

3.03 PROJECT MODIFICATIONS

A. During the progress of construction, if such conditions arise that require revisions, modifications, or relocations to any HVAC equipment, HVAC ductwork, HVAC piping, plumbing piping, or materials incorporated in this project, such alterations shall be immediately called to the attention of the Architect. Contractor shall then prepare necessary Drawings showing proposed changes. Submit proposed changes for review by the Architect prior to actual revision work in the field. There shall be no additional cost incurred for these changes.

B. Two (2) sets of Drawings showing all revisions shall be immediately presented to Architect for his records. Maintain additional copies on the project as necessary to comply with “RECORD DRAWINGS” requirement of the General Requirements.

C. Incorporate all revisions into record Drawings. These drawings shall be up to date at the end of every week and shall be available to Architect or Engineer at any time for inspection.

3.04 GUARANTEE

A. Be responsible for work done and material installed under these plans and specifications. Repair or replace, as may be necessary, any defective work, material, or part which may show itself within one (1) year of filing of Notice of Completion and be responsible for damage to other

materials, furnishing, equipment, or premises caused by such defects during this period, if in the opinion of the Architect said defect is due to imperfection of material or workmanship. Provide all such work and materials at no cost to Owner.

B. Be responsible for damage to any part of premises during guarantee period caused by leaks or breaks in work furnished and/or installed under this section.

C. Replace refrigerant, lubricants, or gases lost as result of defects, breaks, or leaks in work.

3.05 RECORD DRAWINGS

A. In addition, furnish one (1) tracing showing all outside utility connections, piping, etc., installed under this contract. Locate and dimensions all work with reference to permanent landmarks.

B. Match all symbols and designations used in contract Drawings when preparing “Record” Drawings.

C. Indicate clearly and correctly all work installed differently from that shown, and maintain records up to date as work progresses. Include invert elevations of pipes below grade of floor, the floor lines, plugged wyes, tees, caps, exact locations and sizing or piping, location of valves, and the like. Dimension locations from structural points.

D. Properly identify all stubs for future connections as to locations and use by setting of concrete marker at finished grade in manner suitable to Architect.

3.06 MAINTENANCE DATA

A. Submit maintenance data and parts lists for all HVAC systems materials and products. Include product data, shop drawings, and Record Drawings in the maintenance manual all in allowance with the requirements of Division 1.

3.07 CLEANING UP

A. Comply with Supplementary General Conditions.

END OF SECTION 23 0200

SECTION 23 0517

SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

1.02 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.

B. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2013a.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. 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.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

PART 3 EXECUTION

3.01 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Install one pipe sleeve for each individual pipe penetration, do not group multiple pipes in a single sleeve.

E. Provide sleeves when penetrating walls and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

F. 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.

END OF SECTION 23 0517

SECTION 23 0529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, thermal insulated pipe supports, and pipe cover systems.

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.

1.02 QUALITY ASSURANCE

A. Comply with applicable building code.

1.03 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 piping 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. 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. 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. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Comply with MFMA-4.
   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.

C. 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. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.

c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
c. Thickness: 60 mil.

E. Pipe Supports:
1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Manufacturers:
a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
3. Liquid Temperatures Up To 122 degrees F:
a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
b. Support From Below: MSS SP-58 Types 35 through 38.

F. Strut Clamps: Two-piece pipe clamp.
1. Manufacturers:
a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

G. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
1. Manufacturers:
a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

H. Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
b. Shields Material: UV-resistant polypropylene with glass fill.
c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
d. Minimum Service Temperature: Minus 40 degrees F.
e. Maximum Service Temperature: 178 degrees F.
f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

I. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
3. Hollow Masonry: Use toggle bolts.
4. Sheet Metal: Use sheet metal screws.
5. Wood: Use wood screws.

J. Pipe Installation Accessories:
   1. Copper Pipe Supports:
      a. Manufacturers:
         1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.
   2. Thermal Insulated Pipe Supports:
      a. Manufacturers:
         1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.
   3. Overhead Pipe Supports:
   4. Inserts and Clamps:
      a. Manufacturers:
         1) Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.

2.02 PIPING COVER SYSTEM

A. Manufacturers:
   1. Source Limitations: Furnish supports, associated fittings, accessories, and hardware produced by a single manufacturer.

B. General Requirements:
   1. Surface Burning Characteristics: Flame spread index/smoke developed index of 20/250, maximum, when tested in accordance with ASTM E84 or UL 723.

C. Materials:
   1. Piping Cover System: Removal-resistant, modular, snap-fit cover units, clips, and anchors for use with CPVC, steel, and copper piping systems.
   2. Cover Units: L-shaped and U-shaped cross-section units of flame retardant resin material, paintable finish.
   3. Unit Length: 7.5 feet.
   4. Provide coupling fittings for joining units end to end and prefabricated inside and outside corner fittings and end caps as required.
   5. Provide mounting clips to secure covers to wall-ceiling per manufacturer requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. 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. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION 23 0529

SECTION 23 0548

VIBRATION AND SEISMIC CONTROLS FOR HVAC DUCTWORK PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vibration isolators.

B. External seismic snubber assemblies.

C. Seismic restraint systems.

D. Vibration-isolated and/or seismically engineered roof curbs.

1.02 RELATED REQUIREMENTS

A. Section 01 4533 - Code-Required Special Inspections and Procedures.

B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; 2016.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; 2015.

D. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

F. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

G. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

H. MFMA-4 - Metal Framing Standards Publication; 2004.

I. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.

J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - 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. Provide schedule of vibration isolator type with location and load on each.
   2. Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.
   3. Include auxiliary motor slide bases and rails, base weights, inertia bases, concrete weights, equipment static loads, support points, vibration isolators, and detailed layout of isolator location and orientation with static and dynamic load on each isolator.
   4. Include selections from prescriptive design tables that indicate compliance with the applicable building code and the vibration isolator manufacturer's requirements.
   5. Clearly indicate the load and capacity assumptions selected. Include copies of any calculations.
   6. Include the calculations that indicate compliance with the applicable building code for seismic controls and the vibration isolator manufacturer's requirements.

7. Include the seal of the Professional Structural Engineer registered in the State of Illinois in which the Project is located, on drawings and calculations which at a minimum include the following:
    a. Seismic Restraint Details: Detailed drawings of seismic restraints and snubbers including anchorage details that indicate quantity, diameter, and depth of penetration, edge distance, and spacing of anchors.
    b. Equipment Seismic Qualification Certification: Certification by the manufacturer or responsible party that each piece of equipment provided will withstand seismic force levels as specified in the applicable building code for seismic controls.
        1) Basis for Certification: Indicate whether the withstand certification is based on actual testing of assembled components, on calculations, or on historic data.
        2) Indicate equipment to be sufficiently durable to resist design forces and or remain functional after the seismic event.
    c. Dimensioned outline drawings of equipment identifying center of gravity, locations, and provisions for mounting and anchorage.
    d. Detailed description of the equipment anchorage devices on which the certifications are based.
    e. Statement of Special Inspections: Prepared by the registered design professional in responsible charge.

D. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Perform design and installation in accordance with applicable codes.

C. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and registered and licensed in the State in which the Project is located.

D. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
    1. Member of Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).

E. Installer Qualifications: Company specializing in performing the work of this section with minimum ten years of experience.

F. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kinetics Noise Control, Inc: www.kineticsnoise.com.

B. Mason Industries: www.mason-ind.com.

C. M.W. Saussé & Co., Inc. (Vibrex): www.vibrex.net

D. Vibration Eliminator Company, Inc: www.veco-nyc.com.

E. Vibro-Acoustics: www.vibro-acoustics.com

F. The VMC Group: www.thevmcgroup.com

G. Substitutions: See Section 23 0200 - HVAC General Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. General:

1. All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
2. Steel springs to function without undue stress or overloading.
3. Steel springs to operate in the linear portion of the load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
4. Lateral to vertical stiffness ratio to not exceed 0.08 with spring deflection at minimum 75 percent of specified deflection.

2.03 VIBRATION ISOLATORS

A. General Requirements:
   1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
   2. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.

B. Non-Seismic Type:
   1. All Elastomeric-Fiber Glass Pads:
      a. Configuration: Flat or molded.
      b. Thickness: 0.25 inch minimum.
      c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
   2. Elastomeric Mounts:
      a. Material: Oil, ozone, and oxidant resistant compounds.
      b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
   3. Steel Springs:
      a. Assembly: Freestanding, laterally stable without housing.
      b. Leveling Device: Rigidly connected to equipment or frame.
   4. Restrained Steel Springs:
      a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
      b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
   5. Elastomeric Hangers:
      a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
      b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.
   6. Spring Hanger:
      a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
      b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
   7. Combination Elastomeric-Spring Hanger:
      a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.

b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

8. Thrust Restraints:
   a. Housing: Steel construction containing stable steel spring and integral elastomeric element installed in pairs to resist air pressure thrusts.
   b. Bottom Openings: Sized to allow plus/minus 15 degrees rod misalignment.

C. Seismic Type:
1. Coil Springs Consisting of Single Elements:
   a. Housing: Manufactured from cast iron material.
   b. Ductile Material: Designed and rated for seismic applications.
   c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
   d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
   e. Resilient Pad: Located in series with spring.
   f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
   g. Finish: Suitable for the application.
2. All Directional Elastomeric:
   a. Material: Molded from oil, ozone, and oxidant resistant compounds.
   b. Operating Parameters: Designed to operate within the isolator strain limits providing maximum performance and service life.
   c. Attachment Method: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
   d. Rating: Cast iron and aluminum housings rated for seismic restraint applications.
   e. Minimum Operating Static Deflections: Deflections indicated in project documents are not to exceed published load capacities.

2.04 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:
1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

D. Comply with:
1. ASHRAE Handbook - HVAC Applications
2. FEMA 412.
3. FEMA 413.
4. FEMA 414.
5. FEMA E-74.
6. SMACNA (SRM).

E. Cable Restraints:
1. Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.
2. Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.

3. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
4. Connections:
   a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
   b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
5. Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

F. Rigid Restraints:
1. Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
2. Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
3. Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
4. Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
5. Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

2.05 VIBRATION-ISOLATED AND/OR SEISMICALLY ENGINEERED ROOF CURBS

A. Manufacturers:
1. Vibration-Isolated and/or Seismically Engineered Roof Curbs:
   a. Kinetics Noise Control, Inc: www.kineticsnoise.com/#sle.
   b. Mason Industries: www.mason-ind.com/#sle.
   c. Vibration Eliminator Company, Inc: www.veco-nyc.com/#sle.

B. Vibration Isolation Curbs:
1. Nonseismic Curb:
   a. Location: Between structure and rooftop equipment.
   b. Construction: Aluminum.
   c. Integral vibration isolation to comply with requirements of this section.
   d. Weather exposed components consist of corrosion resistant materials.
2. Seismic Curb:
   a. Location: Between structure and rooftop equipment.
   b. Construction: Steel.
   c. Integral vibration isolation to comply with requirements of this section.
   d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.
   e. Weather exposed components consist of corrosion resistant materials.

C. Seismic Type:
1. Non-isolated Curb and Fabricated Equipment Piers:
   a. Location: Between structure and rooftop equipment.
   b. Construction: Steel.
   c. Weather exposed components consist of corrosion resistant materials.
2. Vibration Isolation Curb:
   a. Location: Between structure and rooftop equipment.
   b. Construction: Steel.
   c. Integral vibration isolation to conform to requirements of this section.
   d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.

e. Weather exposed components consist of corrosion resistant materials.

D. Substitutions: See Section 23 0200 - HVAC General Requirements.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's instructions.

B. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.

C. Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

D. Support piping connections to equipment mounted on isolators using isolators or resilient hangers as follows:
1. Up to 4 Inches Pipe Size: First three points of support.
2. Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.02 INSTALLATION - SEISMIC

A. Comply with:
1. ASHRAE Handbook - HVAC Applications.
2. FEMA 412.
3. FEMA 413.
4. FEMA 414.
5. FEMA E-74.
6. SMACNA (SRM).

B. Seismic Snubbers:
1. Provide on all isolated equipment, piping and ductwork.
2. Provide minimum of four seismic snubbers located close to isolators.
3. Snub equipment designated for post-disaster use to 0.05 inch maximum clearance.
4. Snub all other equipment between 0.15 inch and 0.25 inch clearance.

C. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
1. Install equipment anchorage items designed to resist seismic design force in any direction.
2. Install vibration and seismic controls designed to include base and isolator requirements.
3. Provide flexible connections between equipment and interconnected piping.
4. Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.
5. Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.
6. Where concrete floor thickness is less than required for expansion anchor installation, install through bolt in lieu of expansion anchor.
7. Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, install supplemental framing or blocking to transfer loads to structural elements.

D. Suspended Mechanical Equipment:
1. Provide supports and bracing to resist seismic design force in any direction.
2. Provide flexible connections between equipment and interconnected piping.

3. Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
4. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

E. Wall mounted Mechanical Equipment:
1. Provide support and bracing to resist seismic design force in any direction.
2. Install backing plates or blocking as required to deliver load to primary wall framing members.
3. Anchoring to gypsum wallboard, plaster or other wall finish that has not been engineered to resist imposed loads is not permitted.

F. Piping:
1. Provide seismic bracing in accordance ASCE 7.
2. Provide supports, braces, and anchors to resist gravity and seismic design forces.
3. Provide flexible connections between floor mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.
4. Brace resiliently supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to the structure.
5. Brace every run 5.0 feet or more in length with two transverse and one longitudinal bracing locations.
6. Pipes and Connections Constructed of Ductile Materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections):
   a. Provide transverse bracing at spacing not more than 40.0 feet on center.
   b. Provide longitudinal bracing at spacing not more than 80.0 feet on center.
7. Pipes and Connections Constructed of Non Ductile Materials (cast iron, no-hub, plastic or non-UL listed grooved coupling pipe):
   a. Provide transverse bracing at spacing not more than 20.0 feet on center.
   b. Provide longitudinal bracing at spacing not more than 40.0 feet on center.
8. Provide lateral restraint for risers at not more than 30 feet on center or as required for horizontal runs, whichever is less.
9. Piping Explicitly Exempt from Seismic Bracing Requirements:
   a. Provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.
   b. Install piping consistent with ASCE 7, such that swinging of the pipes will not cause damaging impact with adjacent components, finishes, or structural framing while maintaining clear horizontal distance of 67 percent of the hanger length between subject components.
   c. Provide swing restraints as required to control potential impact due to limited space between subject components.
10. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.
11. Re-use of Existing Hangers:
    a. Re-using existing hangers at locations of seismic bracing are to be judged on a case-by-case basis by the registered project design professional.
    b. Unless otherwise shown on drawings, it is assumed all hangers supporting new piping, located at a seismic brace, will be new.

G. Ductwork:

1. Provide seismic bracing for ducts with cross sectional area greater than 6 sq ft (independent of duct contents).
2. Provide seismic bracing for all ducts containing hazardous materials.
3. Provide supports, braces, and anchors to resist gravity and seismic design forces.
4. Install ducts and duct risers designed to accommodate interstory drift.
5. Independently support in-line devices weighing more than 20 pounds.
6. Independently support and brace all in-line devices weighing more than 75 pounds.
7. Provide unbraced piping attached to braced in-line equipment with adequate flexibility to accommodate differential displacements.
8. Positively attach dampers, louvers, diffusers and similar appurtenances to ductwork with mechanical fasteners.
9. Install duct supports designed to resist not less than 150 percent of the duct weight.
10. The use of power driven fasteners is prohibited in the hanging of ducts weighing over 10 pounds per lineal foot for seismic design categories D, E, and F.
11. Use of proprietary restraint systems with a certificate of compliance, verified and listed by an IAS AC172 accredited inspection body or otherwise accepted by applicable codes is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

H. Tanks:
1. Install tank anchorage, tank legs and/or supporting structure designed to resist design force.
2. Provide flexible connections between tank and interconnected piping.

I. Install siesmic restraints for piping as follows:
1. Seismically restrain piping, with an Ip = 1.0, located in boiler rooms, mechanical equipment rooms and refrigeration equipment rooms that is 1¼” I.D. and larger. Type V seismic cable restraints or resilient single arm braces shall be used if piping is isolated. Type V seismic cable restraints or Type VI single arm braces may be used on non-isolated piping.
2. Seismically restrain all other piping 2½” diameter and larger. Type V seismic cable restraints or resilient single arm braces shall be used if piping is isolated. Type VI seismic cable restraints or single arm braces may be used on nonisolated piping.
3. See Table D on drawings for maximum seismic bracing distances.
4. Multiple runs of pipe on the same support shall have distance determined by calculation.
5. Rod braces shall be used for all rod lengths as listed in Table E on drawings.
6. Clevis hangers shall have braces placed inside of hanger at seismic brace locations.
7. 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.
8. Transverse restraint for one pipe section may also act as longitudinal restraint for a pipe section of the same or smaller size connected perpendicular to it if the restraint is installed within 24” of the centerline of the smaller pipe or combined stresses are within allowable limits at longer distances.
9. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints. Use Type V or VI restraint, if trapeze is smaller than 48” long.
10. Where pipe passes through a fire-rated, seismic gypsum wall, the wall can act as a lateral/transverse brace for pipe sizes up to and including 6,” provided fire stopping material is tight to the pipe.
11. Branch lines may not be used to restrain main lines or cross-mains.
12. Where pipe passes through a seismic block or concrete wall, the wall can act as a lateral/transverse brace.
13. Where horizontal pipe crosses a building's drift expansion joint, allowance shall be part of the design to accommodate differential motion.

14. Exemptions are as follows:
    a. All high deformability pipe or conduit 3” or less in diameter suspended by individual hanger rods where Ip = 1.0.
    b. High deformability pipe or conduit in Seismic Design Category C, 2” or less in diameter suspended by individual hanger rods where Ip = 1.5.
    c. High deformability pipe or conduit in Seismic Design Category D, E or F, 1” or less in diameter suspended by individual hanger rods where Ip = 1.5.
    d. All clevis supported pipe or conduit runs installed less than 12” from the top of the pipe to the underside of the support point and trapeze supported pipe suspended by hanger rods having a distance less than 12” in length from the underside of the pipe support to the support point of the structure.
    e. Piping systems, including their supports, designed and constructed in accordance with ASME B31.
    f. Piping systems, including their supports, designed and constructed in accordance with NFPA, provided they meet the force and displacement requirements of Section 13.3.1 and 13.3.2 (ASCE 7-05).

J. Install seismic restraints for ductwork per the following:
    1. Restrain rectangular ductwork with cross sectional area of 6 square feet or larger. Type V seismic cable restraints or Type VI single arm braces shall be used on this duct. Duct that serves a life safety function or carries toxic materials in an “Essential or High Hazard Facility” must be braced with no exceptions regardless of size or distance requirements.
    2. Restrain round ducts with diameters of 28” or larger. Type V seismic cable restraints or Type VI single arm braces.
    3. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
    4. See Table D on drawings for maximum seismic bracing distances.
    5. Duct must 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. Additional reinforcing is not required if duct sections are mechanically fastened together with frame bolts and positively fastened to the duct support suspension system.
    6. 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.
    7. 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.
    8. If ducts are supported by angles, channels or struts, ducts shall be fastened to it at seismic brace locations in lieu of duct reinforcement.
    9. Exemptions are as follows: (Applies to Ip = 1.0 only)
        a. Rectangular, square, and oval air handling ducts less than six square feet in cross sectional area.
        b. Round air handling duct less than 28 inches in diameter.
        c. Duct runs supported at locations by two rods less than 12 inches in length from the structural support to the structural connection to the ductwork.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

D. Inspect isolated equipment after installation and submit report. Include static deflections.

E. Perform testing and inspections of the installation in accordance with Section 01 4533.

END OF SECTION 23 0548

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Pipe markers.

E. Ceiling tacks.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturers catalog literature for each product required.

C. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Control Panels: Nameplates.

C. Dampers: Ceiling tacks, where located above lay-in ceiling.

D. Ductwork: Adhesive-backed duct markers.

E. Major Control Components: Nameplates.

F. Piping: Pipe markers.

G. Small-sized Equipment: Tags.

H. Thermostats: Adhesive backed flexible tape.

2.02 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved letters.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch.
   3. Background Color: Red.
   4. Plastic: Comply with ASTM D709.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved white letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

B. Style: Individual Label.

C. Color: Yellow/Black.

2.05 PIPE MARKERS

A. 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.

B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

C. Color code as follows:
   1. Heating, Cooling, and Boiler Feedwater: Green with white letters.
   2. Flammable Fluids: Yellow with black letters.

2.06 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:
   1. HVAC Equipment: Yellow.
   2. Fire Dampers and Smoke Dampers: Red.
   3. Heating/Cooling Valves: Blue.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

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. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Use tags on piping 3/4 inch diameter and smaller.
   1. Identify service, flow direction, and pressure.
   2. Install in clear view and align with axis of piping.
   3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

F. Install ductwork with Adhesive-backed duct markers. 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.

G. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 0553

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of domestic hot water circulation systems.

C. Measurement of final operating condition of HVAC systems.

1.02 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 and Balancing of Environmental Systems; 2015, with Errata (2017).

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. 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. Include at least the following in the plan:
      a. List of all air 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 drawings during the process.
      d. Final test report forms to be used.
      e. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
         2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
      f. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
      g. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. 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.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

5. Units of Measure: Report data in I-P (inch-pound) units only.
6. 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 Architect/Engineer.
    g. Project Contractor.
    h. Project altitude.
    i. 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. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
    2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
    3. SMACNA (TAB).

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.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
        b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
        c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

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.
12. Domestic Hot Water systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Service and balance valves are open.

B. Beginning of work means acceptance of existing conditions.

3.03 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.

C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.05 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. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. 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.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Where modulating dampers are provided, take measurements and balance at extreme conditions.

3.06 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

D. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Plumbing Pumps.
   2. Air Cooled Refrigerant Condensers.
   3. Air Handling Units.
   4. Fans.
   5. Air Filters.
   6. Air Inlets and Outlets.
   7. Domestic Hot Water Circulation balancing valves.

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.

B. Pumps:
   1. Identification/number.
   2. Manufacturer.
   3. Size/model.
   4. Impeller.
   5. Service.
   6. Design flow rate, pressure drop, BHP.
   7. Actual flow rate, pressure drop, BHP.
   8. Discharge pressure.
   9. Suction pressure.
   10. Total operating head pressure.

C. Air Cooled Condensers:
   1. Identification/number.
   2. Location.
   3. Manufacturer.
   4. Model number.
   5. Serial number.
   6. Number of compressors.

D. Cooling Coils:
   1. Identification/number.
   2. Location.
   3. Service.
   4. Manufacturer.

5. Air flow, design and actual.
6. Water flow, design and actual from record plans.
7. Water pressure drop, design and actual from record plans.
8. Air pressure drop, design and actual.

E. Heating Coils:
1. Identification/number.
2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Water flow, design and actual from record plans.
7. Water pressure drop, design and actual from record plans.
8. Air pressure drop, design and actual.

F. Air Moving Equipment:
1. Identification/Location
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Return air flow, specified and actual.
7. Outside air flow, specified and actual.
8. Total static pressure (total external), specified and actual.
9. Fan RPM.

G. 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.

H. Exhaust Fans:
1. Identification/Location
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.

I. 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.

J. Air Distribution Tests:
1. Air terminal number.

2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.
8. Test (final) velocity.
9. Test (final) air flow.

END OF SECTION 23 0593

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.

D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2014.

E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2016.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than ten years of documented experience.

1.05 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.

1.06 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:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Johns Manville: www.jm.com.
   3. Owens Corning Corporation: www.ocbuildingspec.com.
   4. Substitutions: See Section 23 0200 - HVAC General Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. 'K' value: 0.29 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 by weight.

C. 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.

2.03 DUCT LINER

A. Manufacturers:
   1. Armacell LLC: www.armacell.us.
   2. K-Flex USA LLC: www.kflexusa.com/#sle.
   3. CertainTeed Corporation: www.certainteed.com.
   4. Ductmate Industries, Inc, a DMI Company: www.ductmate.com.
   5. Johns Manville: www.jm.com.
   6. Knauf Insulation: www.knaufinsulation.com.
   7. Owens Corning Corporation: www.ocbuildingspec.com.
   8. Substitutions: See Section 23 0200 - HVAC General Requirements.

B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
   1. Minimum Service Temperature: Minus 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.
   3. Fungal Resistance: No growth when tested according to ASTM G21.
   4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F.
   5. Minimum Noise Reduction Coefficients:
      a. 1/2 inch Thickness: 0.30.
      b. 1 inch Thickness: 0.40.
   6. Connection: Waterproof vapor barrier adhesive.

C. Glass Fiber 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 0.25 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.

D. Adhesive: Waterproof, fire-retardant type, ASTM C916.

E. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to 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. 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.

C. Ducts Exposed in Finished Spaces: Finish with primed and painted metal exterior.

D. Ducts Exposed in Mechanical Equipment Rooms: Finish with metal exterior.

E. 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. 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.
3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

F. Duct Liner Application:
1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners as required. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
3. Seal and smooth joints. Seal and coat transverse joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are sheet metal dimensions.

3.03 SCHEDULES

A. For systems using energy recovery ventilation units and / or dedicated outside air systems, the conditioned fresh air duct from the ventilation unit and the return/exhaust air duct to the ventilation unit upstream of the energy recovery component shall be considered supply and return ducts for the purposes of insulation.

B. Rectangular Return and Supply Ducts in Conditioned Interior Spaces:
1. Flexible Glass Fiber Duct Liner Insulation: Minimum R-Value (4).
2. Flexible Elastomeric Duct Insulation: Minimum R-Value (4).

C. Round Return and Supply Supply Ducts in Conditioned Interior Spaces:
1. Flexible Glass Fiber Duct Insulation: Minimum R-Value (4).

D. Return and Supply Air Ducts installed in Unconditioned Interior Spaces:
1. Flexible Glass Fiber Duct Insulation: Minimum R-Value (6).
2. Flexible Glass Fiber Duct Liner Insulation: Minimum R-Value (6).
3. Flexible Elastomeric Duct Insulation: Minimum R-Value (6).

E. Exhaust Ducts:
   1. Flexible Glass Fiber Duct Insulation: Minimum R-Value (4).

F. Outside Air Intake Ducts:
   1. Flexible Glass Fiber Duct Insulation: Minimum R-Value (8).

END OF SECTION 23 0713

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jacketing and accessories.

1.02 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.

C. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2014.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 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 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   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 23 0200 - HVAC General Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. 'K' value: ASTM C 177, 0.24 at 75 degrees F.
2. Minimum Service Temperature: Minus 40 degrees F.
3. Maximum Service Temperature: 180 degrees F.
4. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.03 JACKETING AND ACCESSORIES

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, 0.010 inch.
e. Connections: Brush on welding adhesive.

B. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.016 inch sheet.
3. Type: Factory-applied, self-adhesive jacketing.
4. Finish: Smooth.
5. Joining: Longitudinal slip joints and 2 inch laps.
6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to 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. Insulated Pipes Conveying Fluids Below Ambient Temperature:
1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

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.

E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400.

F. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

G. Exterior Applications: Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

A. Cooling Systems:

1. Condensate Drains from Cooling Coils:
    a. Flexible Elastomeric Cellular Foam Insulation
    b. Minimum Thickness: 1/2 inch.
2. Refrigerant Piping (VRF Systems):
    a. Flexible Elastomeric Cellular Foam Insulation (EPDM):
    b. High Pressure Gas:
        1) Pipe Size Range: <1 inch.
            (a) Minimum Thickness: 1-1/2 inch.
        2) Pipe Size Range: 1 to 1-1/2 inch.
            (a) Minimum Thickness: 1-1/2 inch.
        3) Pipe Size Range: 1-1/2 to 4 inch.
            (a) Minimum Thickness: 2 inch.
    c. High Pressure Liquid:
        1) Pipe Size Range: <1 inch.
            (a) Minimum Thickness: 1 inch.
        2) Pipe Size Range: 1 to 1-1/2 inch.
            (a) Minimum Thickness: 1-1/2 inch.
        3) Pipe Size Range: 1-1/2 to 4 inch.
            (a) Minimum Thickness: 1-1/2 inch.
    d. Low Pressure Gas:
        1) Pipe Size Range: <1 inch.
            (a) Minimum Thickness: 1 inch.
        2) Pipe Size Range: 1 to 1-1/2 inch.
            (a) Minimum Thickness: 1 inch.
        3) Pipe Size Range: 1-1/2 to 4 inch.
            (a) Minimum Thickness: 1-1/2 inch.
3. Refrigerant Piping (Standard Heat Pump Systems):
    a. Flexible Elastomeric Cellular Foam Insulation (EPDM):
    b. All Refrigerant Pipes:
        1) Pipe Size Range: <1 inch.
            (a) Minimum Thickness: 1 inch.
        2) Pipe Size Range: 1 to 1-1/2 inch.
            (a) Minimum Thickness: 1 inch.
        3) Pipe Size Range: 1-1/2 to 4 inch.
            (a) Minimum Thickness: 1-1/2 inch.

END OF SECTION 23 0719

SECTION 23 0993

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

B. Sequence of operation for:
   1. Dedicated Outdoor Air Systems.
   2. Mini-Split Heat Pumps
   3. Variable Refrigerant Flow Systems.
   4. Radiant panels.
   5. Exhaust / Transfer Fans.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment. Kitchen venitlation equipment sequences may be provided as prepared by the kitchen ventilation equipment manufacturer for standalone system operation.
   1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
   2. Include at least the following sequences:
      a. Start-up.
      b. Warm-up mode.
      c. Normal operating mode.
      d. Unoccupied mode.
      e. Shutdown.
      f. Capacity control sequences and equipment staging.
      g. Temperature and pressure control, such as setbacks, setups, resets, etc.
      h. Detailed sequences for all control strategies, such as economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
      i. Effects of power or equipment failure with all standby component functions.
      j. Sequences for all alarms and emergency shut downs.
      k. Seasonal operational differences and recommendations.
      l. Interactions and interlocks with other systems.
   3. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
   4. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.

C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
   1. Label with settings, adjustable range of control and limits.
   2. Include flow diagrams for each control system, graphically depicting control logic.

3. Include the system and component layout of all equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.

D. Points List: Submit list of all control points indicating at least the following for each point.
   1. Name of controlled system.
   2. Point abbreviation.
   3. Point description; such as dry bulb temperature, airflow, etc.
   4. Display unit.
   5. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
   6. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.
   7. Intermediate point (Yes / No); i.e. a point whose value is used to make a calculation which then controls equipment, such as space temperatures that are averaged to a virtual point to control reset.
   8. Calculated point (Yes / No); i.e. a “virtual” point generated from calculations of other point values.

1.03 QUALITY ASSURANCE

A. Design system under direct supervision of a Professional Engineer experienced in design of this work and licensed at the State in which the Project is located.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEDICATED OUTDOOR AIR SYSTEMS (DOAS)

A. Under normal operating conditions the DOAS system shall be started and stopped by the DDC system and operation shall be based on an adjustable occupied / unoccupied schedule coordinated with the owner's requirements. The unit shall operate during occupied periods and remain off during unoccupied periods.

B. The DOAS unit shall not operate during scheduled building warm-up, cool-down, and unoccupied periods.

C. Upon a call for DOAS unit operation from the DDC system, the DOAS unit intake and exhaust air dampers shall open and the supply air and exhaust air fans Variable Frequency Drive (VFD) controls shall gradually ramp the fans to full operation.

D. Operational Modes:
   1. Heating: When the air temperature leaving the enthalpy wheel is below 60 degrees Fahrenheit (adj.) the unit shall be in heating mode. The enthalpy wheel shall operate and the heat pump heat shall modulate to maintain a supply air temperature of 70 degrees Fahrenheit (adj.). The supply air temperature shall be reset based on space air temperature as follows (locate space sensor(s) in common spaces close to a DOAS return air device):
      a. Ave. Space Air Temperature = 70 deg F: Supply Air Temperature = 70 deg F
      b. Ave. Space Air Temperature = 60 deg F: Supply Air Temperature = 90 deg F
   2. Backup Heating: The unit shall provide electric backup heat when the heat pump heat cannot satisfy the supply air temperature setpoint.
   3. Cooling: When the air temperature leaving the enthalpy wheel is above 70 degrees Fahrenheit (adj.) the unit shall be in cooling mode. Modulating DX cooling and modulating hot gas reheat shall be controlled to to maintain the supply air temperature of 70 degrees Fahrenheit (adj.). The supply air temperature shall be reset based on space air temperature as follows (locate space sensor(s) in common spaces close to a DOAS return air device):

a. Ave. Space Air Temperature = 80 deg F: Supply Air Temperature = 55 deg F
b. Ave. Space Air Temperature = 70 deg F: Supply Air Temperature = 70 deg F

4. Dehumidification: When the entering coil dewpoint exceeds 55 degrees Fahrenheit (adj.), the unit shall be in dehumidification mode. The enthalpy wheel shall operate and modulating DX cooling shall maintain a cooling coil saturated suction temperature of 43 degrees Fahrenheit. Dehumidification has priority over heating and cooling modes. The Modulating Hot Gas reheat coil will control to a leaving air temperature as governed by the Heating and Cooling Mode reset schedules. Saturated Suction Temperatures shall be reset based on space relative humidity as follows (locate space sensor(s) in common spaces close to a DOAS return air device):
   a. Return Air Humidity = 50%: Saturated Suction Temperature = 38 deg F
   b. Return Air Humidity = 40%: Saturated Suction Temperature = 48 deg F
5. Ventilation: This mode shall be active when there is a call for fan operation without the requirement for heating or cooling.

E. A fan stop signal from the building fire alarm panel shall shutdown the unit.

3.02 VARIABLE REFRIGERANT FLOW SYSTEMS (VRF)

A. Under normal operating conditions the VRF system shall be started and stopped by the DDC system and operation shall be based on an adjustable occupied / unoccupied schedule coordinated with the owner's requirements.

B. The VRF system shall be the main source of building conditioning for building warm-up, building cool-down, and unoccupied periods.

C. The units shall be provided with local thermostat control as indicated, the local thermostat must be capable of being locked from local adjustment by a central controller.

D. Operational Modes:
1. Heating: The unit shall provide heat pump heating to maintain the space temperature at the programmed setpoint.
2. Cooling: The unit shall provide cooling to maintain the space temperature at the programmed setpoint.
3. Dry: The unit shall operate in the manufacturer's "dry" mode of operation to maintain the space relative humidity at the programmed setpoint.

3.03 MINI-SPLIT HEAT PUMP SYSTEMS

A. Under normal operating conditions the system shall be started and stopped by a local, stand alone thermostat.

B. Operational Modes:
1. Heating: The unit shall provide heat pump heating to maintain the space temperature at the programmed setpoint.
2. Cooling: The unit shall provide cooling to maintain the space temperature at the programmed setpoint.
3. Dry: The unit shall operate in the manufacturer's "dry" mode of operation to maintain the space relative humidity at the programmed setpoint.

3.04 RADIATION

A. Single temperature room thermostat set at 70 degrees F maintains constant space temperature by energizing electric heaters.

3.05 EXHAUST AND TRANSFER AIR FANS

A. Refer to Equipment Schedule on the plan documents for control requirements.

END OF SECTION 23 0993

SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Moisture and liquid indicators.

C. Valves.

D. Strainers.

E. Check valves.

F. Filter-driers.

G. Expansion valves.

1.02 REFERENCE STANDARDS

A. AHRI 750 - Thermostatic Refrigerant Expansion Valves; 2007.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2013.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

D. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2016.

E. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2016.

F. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

G. ICC (IMC)-2018 - International Mechanical Code; 2018.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design piping system under direct supervision of a Professional Engineer experienced in design of this type of work.

1.05 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 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.

D. Valves:
1. Use service valves on suction and discharge of compressors.
2. Use gauge taps at compressor inlet and outlet.
3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
4. Use check valves on compressor discharge.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Filter-Driers:
1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

2.03 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.
3. Mechanical Press Sealed Fittings: Double pressed type complying with UL 207 and ICC (IMC)-2018.

B. Pipe Supports and Anchors:
1. Conform to ASME B31.5.
2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron adjustable swivel, split ring.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Vertical Support: Steel riser clamp.
5. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
6. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
7. 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.

2.04 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered 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.

2.05 VALVES

A. 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.

B. Service Valves:
1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

2.06 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.

2.07 CHECK VALVES

A. 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.

2.08 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. Connections: As specified for applicable pipe type.

2.09 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 nonreplaceable 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.

2.10 ELECTRONIC EXPANSION VALVES

A. Valve:
   1. Brass body with flared or soldered 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.

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. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.
2. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
3. Place hangers within 12 inches of each horizontal elbow.
4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
5. Provide copper plated hangers and supports for copper piping.

G. 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.

H. Provide clearance for installation of insulation and access to valves and fittings.

I. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 3100.

J. Flood piping system with nitrogen when brazing.

K. Insulate piping and equipment.

L. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

M. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

N. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

O. Fully charge completed system with refrigerant after testing.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

END OF SECTION 23 2300

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

1.02 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2017.

B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

E. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2013.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

I. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience, and approved by manufacturer.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum ten years of documented experience.

1.04 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 comply with 1 standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Medium and High Pressure Supply and Return: 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.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

E. Insulated Flexible Ducts:
1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
a. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
b. Maximum Velocity: 4000 fpm.
c. Temperature Range: -20 degrees F to 210 degrees F.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Provide turning vanes when rectangular elbows must be used.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

G. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.04 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

B. Acoustic Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
1. Insulation: Fiberglass insulation with reinforced vapor barrier.
2. Inner Core: Spun-bonded, non-woven inner core.
3. Pressure Rating: 10 inches wg positive and 1.0 inches wg negative.
4. Maximum Velocity: 4000 fpm.
5. Temperature Range: Minus 20 degrees F to 210 degrees F.

C. Double Wall Insulated Round Ducts: Round spiral lockseam duct with galvanized steel outer wall, 1 inch thick fiberglass insulation, perforated galvanized steel inner wall; fitting with solid inner wall.

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. Duct sizes indicated for round ducts are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Duct sizes indicated for rectangular ducts are sheet metal dimensions. For lined ducts, the dimensions indicated are sheet metal dimensions.

F. Ductwork shall not be fabricated off-site prior to field verification of space available for proper installation and clearances. Any changes and corrections required shall be done at the Contractor's expense.

G. Install and seal metal and flexible ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

H. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. Duct Insulation: Provide duct insulation in compliance with Section 23 0713.

K. At exterior wall louvers, provide double-wall insulated sheet metal duct boot sized to match the louver dimensons.

3.02 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION 23 3100

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers.

C. Duct access doors.

D. Fire dampers.

E. Flexible duct connectors.

F. Volume control dampers.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC Ductwork Piping and Equipment.

B. Section 23 3100 - HVAC Ducts and Casings.

C. Section 23 3600 - Air Terminal Units: Pressure regulating damper assemblies.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Nailor Industries, Inc: www.nailor.com.
   2. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
   3. Greenheck Fan Corporation; www.greenheck.com
   4. Substitutions: See Section 23 0200 HVAC General Requirements.

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.

2.03 DUCT ACCESS DOORS

A. Manufacturers:
   1. Nailor Industries, Inc: www.nailor.com.
   2. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
   3. Greenheck Fan Corporation; www.greenheck.com
   4. Substitutions: See Section 23 0200 HVAC General Requirements.

B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
   1. Less Than 12 inches Square: Secure with sash locks.
   2. Up to 18 inches Square: Provide two hinges and two sash locks.

2.04 FIRE DAMPERS

A. Manufacturers:
   1. Nailor Industries, Inc: www.nailor.com.
   2. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
   3. Greenheck Fan Corporation; www.greenheck.com
   4. Substitutions: See Section 23 0200 HVAC General Requirements.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Horizontal Dampers: Galvanized steel, 22 gauge, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

E. Multiple Blade Dampers: 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

F. Fusible Links: UL 33, separate at 212 degrees F with adjustable link straps for combination fire/balancing dampers.

2.05 FLEXIBLE DUCT CONNECTORS

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.

2.06 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Rossi Industrial Design Firm; www.rossihardware.com
   2. Nailor Industries, Inc: www.nailor.com.
   3. Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
   4. Greenheck Fan Corporation; www.greenheck.com
   5. Substitutions: See Section 23 0200 HVAC General Requirements.

B. Fabricate in accordance with SMACNA (DCS) and as indicated.

C. Splitter Dampers:
   1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges 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 .

D. Single Blade Dampers:
1. Fabricate for duct sizes up to 12 by 12 inch.
2. Blade: 24 gage, 0.0239 inch, minimum.
3. Damper operator shall include a spring-loaded, self-locking handle and thumb trigger to provide positive damper setpoint locking without the use of tools. Damper operator shall be equal to Rossi Everlock model damper operator.

E. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
1. Blade: 14 gage, 0.078 inch, minimum.
2. Damper operator shall include a spring-loaded, self-locking handle and thumb trigger to provide positive damper setpoint locking without the use of tools. Damper operator shall be equal to Rossi Everlock model damper operator.

F. 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 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 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 minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

E. Demonstrate re-setting of fire dampers to Owner's representative.

F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

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 23 3300

SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling exhaust fans.

1.02 RELATED REQUIREMENTS

A. Section 23 0548 - Vibration and Seismic Controls for HVAC Ductwork Piping and Equipment.

B. Section 23 3300 - Air Duct Accessories: Backdraft dampers.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2016.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.

F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.

G. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2017.

H. UL 762 - Outline of Investigation for Power Roof Ventilators for Restaurant Exhaust Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.

1.05 FIELD CONDITIONS

A. Request Owner permission to use permanent ventilator(s) for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Greenheck Fan Corporation: www.greenheck.com.

B. Loren Cook Company: www.lorencook.com/#sle.

C. Substitutions: See Section 23 0200 HVAC General Requirements.

2.02 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: Comply with AMCA 204.

B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.

C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.

D. Fabrication: Comply with AMCA 99.

E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

F. Bearings: Fan products with shaft diameters larger than 3/4 inch and motors larger than one horsepower shall be be air handling quality, heavy duty grease lubricated, ball or roller type.

Bearings shall be selected for a Basic Rating Life, (L10) of 80,000 hours at maximum operating speed and horsepower for each construction level.

G. Kitchen Hood Exhaust Fans: Comply with requirements of NFPA 96 and UL 762.

2.03 CEILING EXHAUST FANS

A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge, and fan speed controller mounted in unit housing or remotely mounted.

B. Disconnect Switch: Cord and plug-in housing for thermal overload protected motor and wall mounted switch.

C. Grille: Aluminum with baked white enamel finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Hung Cabinet Fans:
   1. Install fans with resilient mountings and flexible electrical leads, see Section 23 0548.
   2. Install flexible connections specified in Section 23 3300 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION 23 3423

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers:

B. Rectangular ceiling diffusers.

C. Registers/grilles:
   1. Ceiling-mounted, exhaust and return register/grilles.

D. Louvers:
   1. Combination louvers.

E. Louvered penthouses.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (Reaffirmed 2011).

1.03 SUBMITTALS

A. See Section 01 3000 - 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.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum ten years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hart & Cooley, Inc: www.hartandcooley.com/#sle.

B. Metalaire, a brand of Metal Industries Inc: www.metalaire.com/#sle.

C. Price Industries: www.price-hvac.com/#sle.

D. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.

E. Substitutions: See Section 23 0200 HVAC General Requirements.

2.02 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide square and rectangular, adjustable pattern diffuser to discharge air in four way pattern.

B. Connections: As indicated on drawings.

C. Frame: Provide surface mount and inverted T-bar type.

D. Fabrication: Aluminum with baked enamel finish.

E. Color: As indicated.

F. Accessories: Provide aluminum opposed blade damper volume control damper; gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.03 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.

B. Fabrication: Aluminum with factory finish as indicated on the drawings.

C. Frame: Channel lay-in frame for suspended grid ceilings.

D. Damper: Where required, Integral, gang-operated, opposed blade type with removable key operator, operable from face.

E. Filter Housing: Where indicated, 2" thickness filter housing with hinged face air device to provide filter access from face of air device.

2.04 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Aluminum extrusions with factory factory baked enamel finish.

D. Color: As indicated.

E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.05 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Aluminum extrusions, with factory baked enamel finish.

D. Color: As indicated on the drawings.

E. Damper: Where required, Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.06 LOUVERS

A. Type: 4 inch deep frame with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh screen over intake or exhaust end. Louver design shall inhibit the passage of wind driven rain.

B. Fabrication: Aluminum welded assembly, with factory fluoropolymer spray finish.

C. Color: To be selected by Architect from manufacturer's standard range.

2.07 COMBINATION LOUVERS

A. Damper-combined, drainable louver:

B. Size: As indicated on the drawings.

C. Material: Extruded aluminum.

D. Paint Finish and Color: As indicated on the drawings.

E. Linkage: Concealed in frame.

F. Actuator: As indicated on the drawings.

2.08 LOUVERED PENTHOUSES

A. Type: All welded assembly with 4 inch deep louvers, mitered corners, sheet aluminum roof, with factory fluoropolymer spray finish.

B. Hood Liner Insulation: The removable cover shall be lined with fiberglass insulation to prevent condensation.

C. Color: To be selected by Architect/Engineer from manufacturer's full range.

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 comply 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 9123.

END OF SECTION 23 3700

SECTION 23 4000
HVAC AIR CLEANING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Disposable panel filters.

1.02 REFERENCE STANDARDS

A. UL 900 - Standard for Air Filter Units; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

C. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 FILTER MANUFACTURERS

A. American Filtration Inc: www.americanfiltration.com/#sle.

B. AAF International/American Air Filter: www.aafintl.com.

C. The Camfil Group: www.camfilfarr.com.

D. Substitutions: See Section 23 0200 HVAC General Requirements.

2.02 DISPOSABLE PANEL FILTERS

A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive.
   1. Minimum nominal thickness: 2 inch.

B. Performance Rating:
   1. Face Velocity: 500 FPM.
   2. MERV 13 efficiency rating.

C. Holding Frames: 20 gauge, 0.0359 inch minimum galvanized steel frame with expanded metal grid on outlet side and steel rod grid on inlet side, hinged with pull and retaining handles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install air cleaning devices in accordance with manufacturer's instructions.

B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.

C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters used during construction and testing, with clean set.

END OF SECTION 23 4000

SECTION 23 7310

OUTDOOR CONDENSERS / CONDENSING UNITS

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION

A. This section includes the design, controls and installation requirements for air-cooled condensers / condensing units.

1.02 QUALITY ASSURANCE

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. System Seasonal Energy Efficiency Ratio/Energy Efficiency Ratio (SEER/EER) shall be equal to or greater than prescribed by ASHRAE 90.1, Energy Efficient Design of New Buildings except Low-Rise Residential Buildings.

D. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

C. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Wiring diagram shall be provided with details for both power and control systems and differentiate between factory installed and field installed wiring.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be shipped with doors bolted shut to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be stored in a clean, dry place protected from construction traffic in accordance with the Installation, Operation and Maintenance manual.

1.05 WARRANTY

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment startup or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance and refrigerant.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products shall be provided by the following manufacturers:
   1. AAON
   2. Substitutions: See Section 23 0200 - HVAC General Requirements.

a. The system has been designed based on specific capacities and characteristics of equipment specified in this section and other sections.
b. When substitution of a different manufacturer or model number is desired, submit sufficient information to demonstrate to the Engineer that the substitute will have the same or better performance as that specified AND that the related equipment in the system will perform acceptably with the substitute.
c. If the related equipment must be modified to perform acceptably with the substitute, the entity proposing the substitution is responsible for all additional costs due to re-design and provision of different related equipment.

3. Substitute equipment may be considered for approval that includes at a minimum:
   a. R-410A refrigerant
   b. Hinged access doors with lockable handles
   c. Variable capacity compressor with 10-100% capacity
   d. All other provisions of the specifications must be satisfactorily addressed

2.02 CONDENSING UNITS

A. General Description
   1. Condensing unit shall include compressors, air-cooled condenser coils, condenser fans, suction and liquid connection valves, and unit controls.
   2. Condenser shall include air-cooled condenser coils, condenser fans, discharge and liquid connection valves, and unit controls.
   3. Unit shall be factory assembled and tested including leak testing of the coil and run testing of the completed unit. Run test report shall be supplied with the unit in the controls compartment's literature pocket.
   4. Unit shall have decals and tags to indicate lifting and rigging, service areas and caution areas for safety and to assist service personnel.
   5. Unit components shall be labeled, including split system piping stub outs, refrigeration system components and electrical and controls components.
   6. Installation, Operation and Maintenance manual shall be supplied within the unit.
   7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment's access door.
   8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment's access door.

B. Construction
   1. Unit shall be completely factory assembled, piped, wired and shipped in one section.
   2. Unit shall be specifically designed for outdoor application.
   3. Access to compressors and controls components shall be through hinged access doors with quarter turn, lockable handles.
   4. 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.
   5. Unit shall include lifting lugs.

C. Electrical
   1. Unit shall be provided with standard power block for connecting power to the unit.
   2. Control circuit transformer and wiring shall provide 24 VAC control voltage from the line voltage provided to the unit.
   3. Options:
      a. Air-source heat pump shall include an optimized start defrost cycle to prevent frost accumulation on the outdoor coil during heat pump heating operation and to minimized defrost cycle energy usage. If the temperature of the outdoor heat exchanger and/or the suction line is less than a predetermined value, a deferred defrost cycle is initiated wherein the defrost cycle starts after a variable, continuously

optimizing, time interval has elapsed. The defrost cycle is terminated when the relative temperatures of the outdoor heat exchanger and/or the suction line indicate that sufficient frost is melted from the heat exchanger to insure adequate time between successive defrost cycles for optimizing the efficiency and reliability of the system, or after a predetermined time interval has elapsed, whichever condition occurs first. During defrost cycle all compressors shall energize, reversing valves shall energize, and auxiliary heat shall de-energize.

b. Unit shall be provided with a factory installed and factory wired, non-fused disconnect switch.
c. Unit shall be provided with factory installed and field wired 115V, 15 amp GFI outlet in the unit control panel.
d. Unit shall be provided with phase and brown out protection which shuts down all motors in the unit if the electrical phases are more that 10% out of balance on voltage, the voltage is more that 10% under design voltage, or on phase reversal.

D. Refrigeration System
1. Compressors shall be R-410A scroll type with thermal overload protection and carry a 1 year non-prorated warranty, from the date of original equipment shipment from the factory. Each compressor shall be furnished with a crankcase heater.
2. Compressors shall be mounted in an isolated service compartment which can be accessed without affecting unit operation. Lockable hinged access doors shall provide access to the compressors.
3. Compressors shall be isolated from the base pan with the compressor manufacturer's recommended rubber vibration isolators, to reduce any transmission of sound from the compressors into the building area.
4. Each refrigeration circuit shall be equipped with automatic reset low pressure and manual reset high pressure refrigerant safety controls, Schrader type service fittings on both the high pressure and low pressure sides, and service valves for liquid and suction connections. Liquid line filter driers shall be factory provided. Finished field installed refrigerant circuits shall include the low side cooling components, refrigerant, thermal expansion valve, liquid line, insulated hot gas line, and insulated suction line.
5. Unit shall include a factory holding charge of R-410A refrigerant and oil.
6. Unit shall include 10-100% variable capacity capacity control as noted in schedule.
7. Each capacity stage shall be equipped with a 5 minute off delay timer to prevent compressor short cycling. Each capacity stage shall be equipped with an adjustable 20 second delay timer to prevent multiple capacity stages from starting simultaneously.
8. The unit shall be capable of stable cooling operation to a minimum of 55°F outdoor temperature.
9. Options:
   a. Compressors shall carry a 5 year non-prorated warranty from the date of original equipment shipment from the factory.
   b. All refrigeration circuits shall include a 10-100% variable capacity compressor.
   c. Lead refrigeration circuit shall be provided with hot gas reheat coil in the matching air handler, modulating valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.
   d. Electronically commutated motor driven or Variable frequency drive controlled variable speed condenser fans shall be provided for head pressure control and allow operation down to 25°F.
   e. Condensing unit shall be provided with adjustable on/off condenser fan cycling head pressure control and adjustable compressor lockout to allow cooling operation down to 25°F.

f. Each refrigeration circuit shall be equipped with a liquid line sight glass.
g. Each refrigeration circuit shall be equipped with suction and discharge compressor isolation valves.

E. Condensers
1. Air-Cooled Condenser
a. Condenser fans shall be vertical discharge, axial flow, direct drive fans.
b. Fan motor shall be weather protected, single phase, direct drive, and open drip proof with inherent overload protection.
c. Coils shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum (copper) fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.
d. Coils shall be designed for a minimum of 10°F of refrigerant sub-cooling.
2. Coils shall be hydrogen or helium leak tested.

F. Controls
1. Standard Terminal Block
a. Unit shall be provided with a terminal block for field installation of controls. Option shall include factory installed isolation relays.

PART 3 - EXECUTION

3.01 INSTALLATION, OPERATION, AND MAINTENANCE

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

END OF SECTION 23 7310

SECTION 23 7311

VERTICAL INDOOR AIR HANDLING UNITS

PART 1 - GENERAL

1.01 GENERAL DESCRIPTION

A. This section includes the design, controls and installation requirements for indoor air handling units.

1.02 QUALITY ASSURANCE

A. Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236, Safety Standard for Heating and Cooling Equipment.

B. Unit and refrigeration system shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration.

C. Unit shall be safety certified by ETL and be ETL US and ETL Canada listed. Unit nameplate shall include the ETL/ETL Canada label.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Literature shall be provided that indicates dimensions, operating and shipping weights, capacities, ratings, fan performance, filter information, factory supplied accessories, electrical characteristics, and connection requirements. Installation, Operation and Maintenance manual with startup requirements shall be provided.

C. Shop Drawings: Unit drawings shall be provided that indicate assembly, unit dimensions, construction details, clearances, and connection details. Computer generated fan curves for each blower shall be submitted with specific design operation point noted. Wiring diagram shall be provided with detail for power and control systems and differentiate between factory installed and field installed wiring.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be wrapped in plastic prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.

B. Follow Installation, Operation and Maintenance manual instructions for rigging, moving, and unloading the unit at its final location.

C. Unit shall be handled carefully to avoid damage to components, enclosures and finish.

D. Unit shall be stored in a clean, dry place protected from weather and construction traffic in accordance with Installation, Operation and Maintenance manual instructions.

E. Options:
   1. Unit shall be plastic shrink-wrapped prior to shipment to prevent damage during transport and thereafter while in storage awaiting installation.
   2. Unit shall be crated for (overseas) shipment. Crate shall be fabricated of dimensional lumber and plywood.

1.05 WARRANTY

A. Manufacturer shall provide a limited “parts only” warranty for a period of 12 months from the date of equipment start up or 18 months from the date of original equipment shipment from the factory, whichever is less. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided manufacturer’s written instructions for installation, operation, and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts and air filters.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Products shall be provided by the following manufacturers:
   1. AAON
   2. Substitutions: See Section 23 0200 - HVAC General Requirements.
      a. The system has been designed based on specific capacities and characteristics of equipment specified in this section and other sections.
      b. When substitution of a different manufacturer or model number is desired, submit sufficient information to demonstrate to the Engineer that the substitute will have the same or better performance as that specified AND that the related equipment in the system will perform acceptably with the substitute.
      c. If the related equipment must be modified to perform acceptably with the substitute, the entity proposing the substitution is responsible for all additional costs due to re-design and provision of different related equipment.
   3. Substitute equipment may be considered for approval that includes at a minimum:
      a. R-410A refrigerant
      b. Double wall cabinet construction
      c. Insulation with a minimum R-value of 6.25
      d. Double sloped stainless steel drain pans
      e. Hinged access doors with lockable handles
      f. ECM driven direct drive backward curved plenum supply fans
      g. All other provisions of the specifications must be satisfactorily addressed

2.02 AIR HANDLING UNITS

A. General Description
   1. Indoor air handling units shall include filters, supply fans, DX evaporator coil, reheat coil, electric heaters, energy recovery wheel, and unit controls.
   2. Unit shall have a draw-through supply fan configuration and discharge air vertically as noted in the equipment schedule.
   3. Unit shall be factory assembled and tested including leak testing of the coils and run testing of the supply fans and factory wired electrical system. Run test report shall be supplied with the unit.
   4. Unit shall have decals and tags to indicate lifting and rigging, service areas, and caution areas for safety and to assist service personnel.
   5. Unit components shall be labeled, including pipe stub outs, refrigeration system components and electrical and controls components.
   6. Installation, Operation and Maintenance manual shall be supplied within the unit.
   7. Laminated color-coded wiring diagram shall match factory installed wiring and shall be affixed to the interior of the control compartment’s access door.
   8. Unit nameplate shall be provided in two locations on the unit, affixed to the exterior of the unit and affixed to the interior of the control compartment’s access door.

B. Construction
   1. All cabinet walls and access doors shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
   2. Unit insulation shall have a minimum thermal resistance R-value of 6.25.
   3. 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.
   4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. 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.

5. Access to filters, cooling coil, reheat coil, heating coil, supply fans and electrical and controls components shall be through hinged service access doors.
6. Access doors shall be flush mounted to cabinetry. Coil access door and supply fan access door shall include quarter-turn lockable handles. Supply fan access door shall include removable pin hinges.
7. Units with cooling coils shall include sloped 304 stainless steel drain pan. Drain pan connection shall be on left hand (right hand) side of the unit.
8. Cooling coils shall be mechanically supported above the drain pan by multiple supports that allow drain pan cleaning and coil removal.

C. Electrical
1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Control panel shall be field mounted.
2. Unit shall be provided with standard power block for connecting power to the unit.
3. Unit shall include a factory installed 24V control circuit transformer.
4. Options:
   a. Unit shall be provided with phase and brownout protection which shuts down all electrical components in the unit if the electrical phases are more that 10% out of balance on voltage, the voltage is more that 10% under design voltage or on phase reversal.

D. Supply Fans
1. Unit shall include direct drive unhoused, backward curved, plenum supply fans.
2. Motor shall be a high efficiency electronically commutated motor.
3. Blower and motor assembly shall be dynamically balanced.
4. Blower and motor assembly shall be mounted to isolate assembly vibration.
5. Options:
   a. ECM driven supply fan cfm setpoint shall be set with factory installed potentiometer within the control compartment.

E. Cooling Coil
1. Evaporator Coil
   a. Coil shall be designed for use with R-410A refrigerant and constructed of copper tubes with aluminum fins mechanically bonded to the tubes and aluminum end casings. Fin design shall be sine wave rippled.
   b. Coil with two circuits shall have interlaced circuitry.
   c. Coil shall have 6 rows and minimum 10 fins per inch.
   d. Coil shall be hydrogen or helium leak tested.
   e. Coil shall be furnished with a factory installed thermostatic expansion valves. The sensing bulbs shall be field installed on the suction line immediately outside the cabinet.
   f. Coil shall have external piping connections. Liquid and suction connections shall be sweat connection. Coil connections shall be labeled, extend beyond the unit casing and be factory sealed on both the interior and exterior of the unit casing, to minimize air leakage.

F. Refrigeration System
1. Air handling unit and matching condensing unit shall be capable of operation as an R-410A split system air conditioner as noted in the equipment schedule.
2. Each refrigeration circuit shall be equipped with thermostatic expansion valve type refrigerant flow control.
3. Options:

a. Modulating hot gas reheat shall be provided on the lead refrigeration circuit. Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a dehumidification control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space. Modulating reheat valves shall be factory installed in the matching AAON condensing unit. Reheat line connections shall be labeled, extend beyond the unit casing and be located near the suction and liquid line connections for ease of field connection. Connections shall be factory sealed on both the interior and exterior of the unit casing to minimize air leakage.
b. Refrigeration circuit shall be equipped with a liquid line sight glass.

G. Electric Heating
1. Unit shall include an include electric heater consisting of electric heating coils, fuses, and a high temperature limit switch, with capacities as shown on the plans.
2. Electric heating coils shall be located in the reheat position downstream of the supply fans.
3. Options:
a. Electric heat shall have fully modulating capacity controlled by an SCR (Silicon Controlled Rectifier). A 0-10 VDC heating control signal shall be field provided to control the amount of heating.

H. Filters
1. Options:
a. Unit shall include 4 inch thick, pleated panel filters with an ASHRAE efficiency of 85% and a MERV rating of 13, upstream of the cooling coil. (Unit shall also include 2 inch thick, pleated panel pre filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the 4 inch standard filters.)
b. Unit shall include factory installed Magnehelic gauge measuring the pressure drop across the filter rack.

I. Energy Recovery
1. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. Frame shall slide out for service and removal from the cabinet.
2. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.
3. Wheels shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.
4. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.
5. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.
6. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified

by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

7. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard AAON limited parts warranty. The remaining period of the warranty shall be covered by Airxchange. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided the Airxchange written instructions for installation, operation and maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts. Refer to the Airxchange Energy Recovery Cassette Limited Warranty Certificate.
8. Hinged service access door shall allow access to the wheel.
9. Options:
    a. Total energy recovery wheels shall be coated with silica gel desiccant permanently bonded by a process without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.

J. Controls
1. Unit shall be provided with an external control panel with separate low voltage control wiring with conduit and high voltage power wiring with conduit between the control panel and the unit. Control panel shall be field mounted.
2. Options:
    a. Factory Installed and Factory Provided Controller
        1) Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested.
        2) Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
        3) Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
        4) Controller shall include non-volatile memory to retain all programmed values, without the use of an external battery, in the event of a power failure.
    b. Make Up Air Controller
        1) Unit shall modulate cooling with constant airflow to meet ventilation outside air loads. Cooling capacity shall modulate based on supply air temperature.
        2) Hot gas bypass shall be required on the lead refrigeration circuits of systems without variable capacity compressors.
        3) With modulating hot gas reheat, unit shall modulate cooling and hot gas reheat as efficiently as possible, to meet outside air humidity loads and prevent supply air temperature swings and overcooling of the space.
        4) Outside air temperature sensor and supply air temperature sensor shall be furnished with the unit for field installation.
        5) With the modulating hot gas reheat option an outside air humidity sensor shall be furnished with the unit for field installation. Suction pressure sensor shall be

factory installed. Supply air temperature and space humidity setpoints, for the dehumidification mode of operation, shall be adjustable.

c. Options:

1) Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network.

PART 3 - EXECUTION

3.01 INSTALLATION, OPERATION, AND MAINTENANCE

A. Installation, Operation and Maintenance manual shall be supplied with the unit.

B. Installing contractor shall install unit, including field installed components, in accordance with Installation, Operation and Maintenance manual instructions.

C. Start up and maintenance requirements shall be complied with to ensure safe and correct operation of the unit.

END OF SECTION 23 7311

SECTION 23 8129

VARIABLE REFRIGERANT VOLUME HVAC SYSTEM

A. Substitutions: This section is currently based on the products of Mitsubishi HVAC, which is the only manufacturer named. How should other manufacturers be handled?

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Variable refrigerant volume HVAC system includes:
   1. Outdoor/condensing unit(s).
   2. Indoor/evaporator units.
   3. Heat Recovery units.
   4. Refrigerant piping.
   5. Control panels.
   6. Control wiring.

B. Basis of Design Equipment List is in Section 23 8130.

1.02 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2017.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, and alternate systems/products, as defined above, proposer shall submit all data described in this article, under the terms given for substitutions stated in PART 2.

C. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:
   1. Outdoor/Central Units:
      a. Refrigerant Type and Size of Charge.
      b. Cooling Capacity: Btu/h.
      c. Heating Capacity: Btu/h.
      d. Cooling Input Power: Btu/h.
      e. Heating Input Power: Btu/h.
      f. Operating Temperature Range, Cooling and Heating.
      g. Air Flow: Cubic feet per minute.
      h. Sound Pressure Level: dB(A).
      i. Electrical Data:
         1) Maximum Circuit Amps (MCA).
         2) Maximum Fuse Amps (MFA).
         3) Maximum Starting Current (MSC).
         4) Full Load Amps (FLA).
         5) Total Over Current Amps (TOCA).
         6) Fan Motor: HP.
      j. Weight and Dimensions.
      k. Maximum number of indoor units that can be served.
      l. Maximum refrigerant piping run from outdoor/condenser unit to indoor/evaporator unit.
      m. Maximum height difference between outdoor/condenser unit to indoor/evaporator unit, both above and below.

n. Control Options.

2. Indoor/Evaporator Units:
   a. Cooling Capacity: Btu/h.
   b. Heating Capacity: Btu/h.
   c. Cooling Input Power: Btu/h.
   d. Heating Input Power: Btu/h.
   e. Air Flow: Cubic feet per minute.
   f. Fan Curves.
   g. External Static Pressure (ESP): Inches WG.
   h. Sound Pressure level: dB(A).
   i. Electrical Data:
      1) Maximum Circuit Amps (MCA).
      2) Maximum Fuse Amps (MFA).
      3) Maximum Starting Current (MSC).
      4) Full Load Amps (FLA).
      5) Total Over Current Amps (TOCA).
      6) Fan Motor: HP.
   j. Maximum Lift of Built-in Condensate Pump.
   k. Weight and Dimensions.
   l. Control Options.
3. Control Panels: Complete description of options, control points, zones/groups.

D. Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
   1. Detailed piping diagrams, with branch balancing devices.
   2. Condensate piping routing, size, and pump connections.
   3. Detailed power wiring diagrams.
   4. Detailed control wiring diagrams.
   5. Locations of required access through fixed construction.
   6. Drawings required by manufacturer.

E. Operating and Maintenance Data:
   1. Manufacturer's complete standard instructions for each unit of equipment and control panel.
   2. Custom-prepared system operation, troubleshooting, and maintenance instructions and recommendations.
   3. Identification of replaceable parts and local source of supply.

F. Warranty: Executed warranty, made out in Owner's name.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Compressors: Provide manufacturer's warranty for six (5) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of the Manufacturer according to apllicable terms and conditions. All warranty service work shall be preformed by a factory trained service professional.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: The system design shown in the contract documents is based on equipment and system designed by LG Electronics USA; www.lghvac.com.

B. Systems designed and manufactured by other manufacturers will be considered under the terms described for substitutions with the following exceptions:
   1. Substitution requests will be considered only if received at least 10 days prior to the bid date.
   2. Substitution requests will be considered only if required submittal data is complete; see article SUBMITTALS above.
   3. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design.
   4. Contractor or HVAC subcontractor shall certify that the substitute system will achieve the performance specified.
   5. Do not assume substitution has been accepted until formal written notice has been issued by Architect/Engineer.

2.02 HVAC SYSTEM DESIGN

A. System Operation: Heating and cooling, simultaneously.
   1. Zoning: Provide capability for temperature control for each individual indoor/evaporator unit independently of all other units.
   2. Zoning: Provide heating/cooling selection for each individual indoor/evaporator unit independently of all other units.
      a. Exception: Where indicated, multiple indoor/evaporator units may be controlled in groups.
   3. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.
   4. Conditioned spaces are indicated on drawings.
   5. Outdoor/Condenser unit locations are indicated on drawings.
   6. Indoor/Evaporator unit locations are indicated on drawings.
   7. Heat Reovery unit locations are shown on the drawings.
   8. Required equipment unit capacities are indicated on drawings.
   9. Refrigerant piping sizes are shown on the drawings.
   10. Connect equipment to condensate piping provided by others; condensate piping is indicated on drawings.

B. Cooling Mode Interior Performance:
   1. Daytime Setpoint: 72 degrees F, plus or minus 2 degrees F.
   2. Setpoint Range: 57 degrees F to 77 degrees F.
   3. Night Setback: 78 degrees F.
   4. Interior Relative Humidity: 50 percent, maximum.

C. Heating Mode Interior Performance:
   1. Daytime Setpoint: 72 degrees F, plus or minus 2 degrees F.
   2. Setpoint Range: 59 degrees F to 80 degrees F.
   3. Night Setback: 60 degrees F.

4. Interior Relative Humidity: 20 percent, minimum.

D. Outside Air Design Conditions:
   1. Summer Outside Air Design Temperature: 0.4 percent cooling design condition listed in ASHRAE Fundamentals Handbook - ASHRAE (FUND).
   2. Winter Outside Air Design Temperature: 99.6 percent heating design condition listed in ASHRAE Fundamentals Handbook - ASHRAE (FUND).

E. Operating Temperature Ranges:
   1. Cooling Mode Operating Range: 23 degrees F to 110 degrees F dry bulb.
   2. Heating Mode Operating Range: minus 4 degrees F to 60 degrees F wet bulb, without auxiliary heat source.

F. Refrigerant Piping Lengths: Provide equipment capable of serving system with following piping lengths without any oil traps:
   1. Maximum Piping Length from Outdoor/Central Unit(s) to Furthest Terminal Unit: 540 feet, actual; 620 feet, equivalent.
   2. Total Combined Liquid Line Length: 2625 feet, maximum.
   3. Maximum Vertical Distance Between Outdoor/Central Unit(s) and Terminal Units: 164 feet.

G. Controls: Provide the following control interfaces:
   1. For Each Indoor/Evaporator Unit: One wall-mounted wired "local" controller, with temperature sensor; locate where indicated.
   2. One central remote control panel for entire system; locate where indicated.
   3. The building automation system by the VRF manufacturer is not specified in this section. Consult the manufacturer for details.

H. Local Controllers: Wall-mounted, wired, containing temperature sensor.

I. Remote Temperature Sensors: In addition to temperature sensors integral with indoor/evaporator units, provide wall-mounted, wired remote temperature sensors located in the same room for all units as indicated on the drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that required electrical services have been installed and are in the proper locations prior to starting installation.

B. Verify that condensate piping has been installed and is in the proper location prior to starting installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions.

C. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

D. Coordinate with installers of systems and equipment connecting to this system.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Provide manufacturer's field representative to inspect installation prior to startup.

3.04 SYSTEM STARTUP

A. Provide manufacturer's field representative to observe and approve system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

3.05 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstrate proper operation of equipment to Owner's designated representative.

C. Provide one (1) spare filter for each piece air handling equipment in addition to the filter provided with the unit.

3.07 PROTECTION

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

END OF SECTION 23 8129

SECTION 23 8130

VARIABLE REFRIGERANT FLOW HVAC SYSTEM EQUIPMENT

Part 1. GENERAL

1.01 Basis of Design Shall be LG

A. Acceptable standards shall be supplied based upon the performance characteristics and features of the LG model number(s) specified, LG model families specified, and as otherwise specified herein. Alternate suppliers shall request permission to bid, in writing, from the engineer at least 10 days prior to the bid date. This request by the contractor to bid an alternate supplier to the basis of design, listed or not listed, shall not relieve the contractor of supplying all materials, options, controls, sequences, efficiencies and intents of the original specifications written or implied by LG model number or model family or as otherwise specified. The written request and engineers' written response to such request shall be included in all submittal documents for approval.

1.02 Alternate Equipment Bid Instruction

B. The contractor shall provide basis of design bid as specified and with specified products. If the contractor should wish to propose any alternate products to the basis of designed products they shall provide a separate and complete Bid detailing the proposed alternate products and the associated adjustment of price to support the change from basis of design products. The contractor bids the alternate product with full knowledge that the proposed product may not be acceptable or approved. In no event shall the contractor be entitled to additional compensation to supply such specified products, options, sequences or intents. Any and all additional cost, to any party, because of any product submitted on or supplied other than that of the original specified products shall be the responsibility of the contractor without recourse. It is agreed that any and all disputes regarding any differences between the specified products, options, sequences or intents and that proposed as an alternate shall be arbitrated by the engineer of record. It shall be further agreed by all parties that all decisions of arbitration shall be final and binding. Any product proposed as an alternate shall have been offered, as a VRF product, in the United States for a minimum of (5) years.

1.03 System Performance Documentation

A. The manufacturer shall provide published outdoor unit performance data in table format which states the product heating and cooling capacities expressed in British thermal units per hour (BtuH) and power consumption expressed in kilowatts (kW) at a minimum of 8 possible combinations of allowed conditions between 50% and 130% connection ratio (VRF systems). Possible combinations of allowed condition variables include Combination Ratios expressed as a percentage value, Outdoor Ambient Temperature expressed in degrees Fahrenheit (°F), and indoor unit Entering Air wet and dry bulb temperature expressed in degrees Fahrenheit (°F). Any product whose system design and engineering manuals or guides where published data tables are expressed in units other than these specified will not be accepted.

B. Any product whose published documentation requires the design engineer to apply a correction factor derived from a published curve or tabular data for combination ratio, outdoor ambient temperature, and/or entering air temperature against rated conditions to obtain performance at any possible combination of allowed conditions will not be accepted.

1.04 **Submittals**

A. A complete submittal package shall be compiled and 10 copies shall be forwarded to the general contractor who shall supply the architect with the submittals for dissemination to all parties. The submittal shall be a collection of documents that represent the technical aspects of each product or collection of products to be used on the project. All performance submissions shall be calculated at the design temperatures, Nominal performance data shall not be accepted. The submission and approval of said submittals does not relieve the contractor of supplying all requirements set forth in the specification and drawings. Any substitutions offered by the contractor shall include, as a separate document, any and all differences between the submitted products and the specified products including but not limited to, all dimensions, electrical, control, weights, warranties, country of origin.

B. If submittals contain any proposed alternate equipment specifications, calculations, dimensions, electrical specifications, sound specifications or any other mandated submission which are not accepted, are noted or rejected for any reason the contractor shall be allowed to correct any deficiency and re-submit a second time. Should there be any irregularities found on second submission, the contractor will be directed to and agrees to submit on the original specified products, including any changes or revisions, and provide those specified products without any additional compensation.

1.05 **Delivery, Storage and Handling**

A. Provide a dry and clean place for the products. Comply with manufacturer’s instructions on handling to prevent products from damaging. If product is damaged upon arrival, reject the shipment. If hidden damage is found after removing the product from the container, retain container and all packing material. Contractor is responsible for filing a claim with the freight carrier.

1.06 **Upon Job Completion**

A. Provide the owner with an LG tablet containing a copy of approved submittal, LGMV Mobile (VRF system service diagnostics) software, project mechanical and control drawings, all as-built piping drawings, seismic data certificates, installation, operation and maintenance manuals, troubleshooting guides, service manuals and engineering manuals in PDF format.

B. Provide the owner with an LG tablet containing a copy of the approved submittal package, a full set of drawings and specifications, on boarding software, custom documents, such as control drawings, shop drawings, wiring diagrams, BMS software, GUI image files, commissioning reports, refrigerant charge calculations, refrigerant piping design and as-built reports, O&M’s, troubleshooting guides, service manuals, and equipment engineering manuals in .pdf format. Tablet shall also include a licensed copy of deluxe version of the VRF equipment manufacturer’s service diagnostics.

Part 2. STANDARDS/CERTIFICATIONS

2.01 Certified Product Performance Ratings

A. All VRF (Variable Refrigerant Flow) and VSMS (Variable Speed Multi-Split and Mini- Split) products shall have published performance ratings certified by AHRI (Air-Conditioning, Heating, and Refrigeration Institute) and listed in the AHRI certified product directories available at www.ahridirectory.org.

2.02 Production Facility Certifications

A. All system components shall be manufactured in production facilities maintaining the following ISO certifications:

1. ISO 9001 Quality Management System
2. ISO 14001 Environmental Management System

2.03 UL Compliance

A. All system shall comply with Underwriters Laboratories (UL) 1995 5th edition of the Standard for Safety for Heating and Cooling Equipment Standard for Safety and bear the Electrical Testing Laboratories (ETL) and/or Canadian Standards Association (CSA) mark on the product name plate.

2.04 Electrical Standard

A. All system electrical power wiring shall be installed in accordance with the NFPA 70 National Electrical Code (NEC) or applicable state and local building codes.

2.05 Corrosion Quality Control

A. Outdoor unit painted surfaces shall be factory tested for a minimum of 1000 hours using the accelerated salt spray test procedure as documented in ASTM Standard B-117 using the Surface Scratch Test Procedure. Photographic evidence shall be available upon request by the Engineer of Record.

B. Photographic evidence shall include images of the test sample showing the surface scratch area at zero (0) hours, 400 hours, and 1000 hours. Post-test images of the sample must show no significant deterioration of the coating material, blistering, flaking, peeling, or rust formation along the test scratch.

2.06 Buy American

A. Product manufacturer shall provide documentation, approved for Buy American Act (BAA) and Trade Agreement Act (TAA), signed by the company's legal agent that certifies that none of the proposed/supplied equipment and control devices were manufactured or assembled in China/Thailand or any other non-WTO original signatory country.

Part 3. PRODUCT(S) - Outdoor Units (Variable Refrigerant Flow Systems)

3.01 Multi V™ 5 Heat Recovery and Heat Pump System(s) – (6 to 42 tons nominal)

1. LG Multi V 5 heating and cooling system shall be an air cooled system allowing user to configure in the field a heat pump or a heat recovery system consisting of one to three outdoor unit modules, conjoined to make a 6-42 ton single refrigerant circuit.

a) Heat recovery systems, employing three pipes, shall be connected to Heat recovery (heat recovery) unit(s) and indoor unit(s). Multi-port heat recovery units shall allow simultaneous heating and cooling of individual zone(s) at various capacities as required to satisfy their zone requirements.

b) Heat pump systems shall require two pipes, simultaneous heating and cooling shall not be supported. The heat recovery system shall consist of three pipes, liquid, suction and hot gas pipes. Heat recovery systems operating at 0°F that cannot deliver single phase superheated refrigerant vapor at a minimum of 162°F while operating in the heating mode shall not be acceptable.

2. All three-phase VRF heat pump and heat recovery outdoor units shall be from the same product development generation. Mixing of outdoor units from different development generations is not acceptable.

B. Operating Conditions

1. Outdoor Unit shall be capable of continuous compressor operation between the following operating ambient air conditions, operation outside of these conditions are possible and may involve non-continuous operations.

2. Operating Ambient Air Conditions:

a) Cooling: 5°F DB to 122°F DB

b) Heating: -22°F WB to 61°F WB

c) Cooling Based (ODU reversing valve in cooling position) Synchronous: 14°F DB to 81°F DB (Heat Recovery Operation Only)

d) Heating Based (ODU reversing valve in heating position) Synchronous: 14°F WB to 61°F WB (Heat Recovery Operation Only)

C. Electrical

e) All air source heat pump and heat recovery frame(s) shall be designed and electrically protected to maintain stable continuous compressor operation when provided with 208-230/60/3 power with the following specifications:

i. 208-230/60/3

1. Voltage fluctuation of ± 10%

ii. Voltage imbalance of up to two percent;

iii. Power surge of up to 5kA RMS Symmetrical.

D. General Features

1. The air-conditioning system shall use R410A refrigerant.

2. Each system shall consist of one, two or three air source outdoor unit modules conjoined together in the field to result in the capacity specified elsewhere in these documents.

3. Dual and triple frame configurations shall be field piped together using manufacturer’s designed and supplied Y-branch kits and field provided interconnecting pipe to form a common refrigerant circuit.

4. System shall have following frame configurations vs. capacity.

    a) 6 to 20 ton units shall be a single frame only.

    b) 22 to 34 ton units shall be dual frame only.

    c) 36 to 42 ton heat recovery units shall be triple frame only

5. System shall employ self-diagnostics function to identify any malfunctions and provide type and location of malfunctions via fault alarms.

6. Field Provided Refrigerant Piping

    a) The refrigerant piping system shall be constructed using field provided ACR copper rated for the use with refrigerant R410A, de-hydrated pipe field engineered and assembled with manufacturer supplied Heat recovery unit(s) and Y- branches, as may be required, connected to multiple (ducted, non-ducted or mixed combination) indoor units to effectively and efficiently control the heat pump operation or simultaneous heating and cooling operation of the heat recovery VRF system. Other pipe materials, if used, shall perform, at a minimum, as well as that specified above, shall not have any adverse reactions, for example galvanic corrosion or branch to branch differential pressure drop, with any other components or materials also in use in the system and shall be installed per manufacturer's instructions.

    b) The unit shall be shipped from the factory fully assembled including internal refrigerant piping, inverter driven compressor(s), controls, temperature sensor, humidity sensor, contacts, relay(s), fans, power and communications wiring as necessary to perform both Heat Pump and Heat Recovery operations.

    c) Each outdoor unit refrigeration circuit shall include, but not limited to, the following components:

        i. Refrigerant strainer(s)

        ii. Check valve(s)

        iii. Inverter driven, medium pressure vapor injection, high pressure shell compressors

        iv. Liquid refrigerant cooled inverter PCB

        v. Oil separator(s)

        vi. Accumulator /controlled volume receiver(s)

        vii. 4-way reversing valve(s)

        1. Vapor injection valve(s)

        viii. Variable path heat exchanger control valve(s)

        ix. Oil balancing control

        x. Oil Level sensor(s)

xi. Electronic expansion valve(s)

1. Sub-cooler (s)

2. Vapor Injection Valve(s)

xii. High and low side Schrader valve service ports with caps

1. Service valves

7. Field Insulation:

a) All refrigerant pipe, y-branches, elbows and valves shall be individually insulated with no air gaps. Insulation heat transfer resistance shall not be less than the minimum called for by the local building code, local energy code or as a minimum per manufacture installation requirements. In no case shall the insulation be installed in a compressed state at any point in the system.

i. All joints shall be glued and sealed per insulation manufactures instructions to make a vapor tight assembly.

8. Microprocessor**:**

a) Factory installed microprocessor controls in the outdoor unit(s), heat recovery unit(s), and indoor unit(s) shall perform functions to optimize the operation of the VRF system and communicate in a daisy chain configuration between outdoor unit and heat recovery unit(s) and indoor unit(s) via RS485 (shielded twisted wire pair) network. Control devices shall also be available to control other building systems as required from the VRF control system. DIO/AIO capabilities shall be available as well as a central controller to perform operation changes, schedules and other duties as required by this specification. Addition of separate building control system shall not be required. Other control devices and sequences shall be as specified in other sections of this project specification.

9. Inverter PCB Cooling:

a) Cooling of the inverter PCB shall be conducted by way of high pressure, sub-cooled liquid refrigerant via heat exchanger attached to the inverter PCB. The full capacity flow of refrigerant shall pass though the heat exchangers to maximize the cooling effect of the PCBs and to aid in the evaporation process and capacity of the outdoor coil during the heating mode. The recovered heat of the PCBs must be used to enhance the overall heating process, other uses or dissipation of heat to ambient shall not be permitted.

10. Compressor Control:

a) Fuzzy control logic shall establish and maintain target evaporating temperature (Te) in cooling mode and condensing temperature (Tc) in heating mode by Fuzzy control logic to ensure the stable system performance.

11. Initial Test Run (ITR) (Heating or Cooling) / Fault Detection Diagnosis (FDD) Code:

a) This control mode shall monitor and display positive or negative results of system initial startup and commissioning. Heating or Cooling ITR mode will be automatically selected. It shall monitor and provide performance metrics for the following, but not be limited to, refrigerant charge validation, auto-charge operation verification, refrigerant cycle stability, connection ratios, indoor unit status, error status, and number of indoor units connected. This commissioning specific control mode shall not replace the system error monitoring control system during normal operation.

12. BMS Integration:

a) The VRF system shall be able to integrate with Building Management Systems via BACnet™ IP gateway. This gateway converts between BACnet™ IP or Modbus TCP protocol, and RS-485 LGAP (LG Aircon protocol) allowing third party control and monitoring of the LG A/C system, or LonWorks™ gateways. See controls specification for points list.

13. Wi-Fi Communication:

a) The outdoor unit microprocessor shall be capable of being monitored via an optional Wi Fi wireless communications dongle or embedded Wi Fi transmitter. Wi-Fi shall allow service or maintenance personal access to the complete operating system, via LGMV mobile, without need of tools other than smart phone or tablet. Active live system review, collection of all system data for a field determined duration presented in a .csv file format or collection of all operating conditions, including all indoor units, valves, sensors, compressor speeds, refrigerant pressures, etc., by snapshot of conditions and placing that snapshot into a power point slide to be reviewed at another time. Systems that require computers, hard wire only connection or other devices to collect, review or record operating conditions shall not be allowed.

14. Indoor Unit Connectivity:

a) The system shall be designed to accept connection up to <64> indoor units of various configuration and capacity, depending on the capacity of the system.

15. Power and Communication Interruption:

a) The system shall be capable of performing continuous operation when an individual or several indoor units are being serviced; communication wire cut or power to indoor unit is disconnected from power for a minimum of a 24 hour period. Systems that alarm and/or shut down because of a lack of power to any number of indoor units shall not be acceptable.

16. Connection Ratios:

a) The maximum allowable system combination ratio for all VRF systems shall be 130% and the minimum combination ratio shall be 50%.

17. Comfort Cooling Mode:

a) Comfort cooling shall be initiated via a field setting at the outdoor unit during commissioning or anytime thereafter. Comfort cooling shall allow user to select all or some of the indoor units of a system to automatically modify each of the indoor unit's superheat target set point based on the impending total cooling load of on the indoor unit, the rate of change of the zone temperature relative to set point and optionally, if specified, the rate of change of the zone humidity level.

18. The outdoor unit shall be provided with a factory installed fusible plug or rupture disc. The fusible plug connection shall be threaded for easy connection with a field provided vent pipe to safely discharge the system's refrigerant charge away from the outdoor unit if a building fire causes an extreme pressure condition in the outdoor unit refrigerant circuit employ for safety a threaded fusible plug.

19. Refrigerant Flow Control

a) An active refrigerant -in-circulation control system consisting of a refrigerant storage container, interconnecting refrigerant piping control valves, pressure transducers, microprocessor control, and software to continuously monitor necessary refrigeration cycle operating parameters to maintain stable cycle operation between minus (-)22°F and 122°F ambient conditions. The refrigerant system operating conditions shall be checked by the algorithm at three minute intervals and if needed automatically and dynamically remove and store refrigerant to the storage tank or inject refrigerant from the tank into the refrigerant circuit.

i. The algorithm shall adjust refrigerant charge automatically:

1. As the outdoor air temperature changes;

2. System mode of operation changes;

3. The path of refrigerant flow through the outdoor coil is modified;

4. The system's target suction and head pressure control values are adjusted.

b) Subcooler: The VRF outdoor unit shall include a factory provided and mounted sub-cooler assembly consisting of a shell and tube-type sub-cooling heat exchanger and EEV providing refrigerant sub-cooling modulation control by fuzzy logic of EEV and by mode of operation to provide capacity and efficiency as required. Brazed plate heat exchangers shall not be allowed for this function.

c) Advanced Smart Load Control: The air source unit shall be provided with Smart Load Control (SLC) enhanced energy saving algorithm that reduces compressor lift during off-peak operation to further reduce system energy consumption when weather and load conditions permit.

ii. The SLC algorithm shall be monitoring in real time, the rate of change of the outdoor ambient air temperature, either the outdoor ambient air relative humidity or the indoor air relative humidity [field selectable], and the rate of change of the building load.

iii. The SLC algorithm shall foresee pending changes in the building load, outdoor temperature and humidity (or indoor humidity) and proactively reset head and/or suction pressure targets in anticipation of the reduction/increase in building load.

iv. The SLC algorithm shall provide no fewer than three (3) field selection options to maximize the control of the VRF system operation during morning warm-up or cool-down following night-setback reset. The selection shall be set by the commissioning agent (or at any other time thereafter). Selectable algorithm choices include:

2. Maximize energy savings

3. Balance the rate of temperature change with energy consumed.

4. Quickly cool/heat the building.

20. Refrigerant Volume Management

a) Active Refrigerant Charge

i. The VRF system shall be able to operate at any and all published conditions year round in cooling or heating mode without the need of adding or removing refrigerant from the system.

ii. The air source unit shall be provided with an isolated vessel, interconnecting piping, valves and sensors to store refrigerant and actively pass refrigerant to (or from) the refrigerant circuit in real time as necessary to maintain stable refrigeration cycle operation.

iii. The air source unit microprocessor shall be provided with an algorithm that monitors the VRF system head pressure, suction pressure, subcooling, superheat, compressor speed, high and low side temperatures and the load on the system at three minute intervals and if needed, automatically and dynamically remove and store refrigerant to the storage tank or inject refrigerant from the tank into the refrigerant circuit.

b) Manual Seasonal Refrigerant Charge Adjustments

(Applicable for VRF systems without Active Refrigerant Charge)

iv. Alternates: Systems that **CANNOT** passively and automatically modify the active refrigerant charge using the method(s) stated in the section *Active Refrigerant Charge* shall clearly state so in bold capital letters in the proposal that this feature is not included.

5. VRF systems that cannot perform active refrigerant control may submit their proposal as an Alternate. However all Alternate proposals must BUT include as part of the equipment price the cost of to provide bi-annual refrigerant charging services for 15 years. Service shall be performed by the factory authorized agent only. Service shall include refrigerant, parts, labor, truck and/or trip charges, and any miscellaneous fees necessary to analyze the current state of the system and perform the refrigerant charge adjustment. Service must occur one month before the winter season and one month before the summer season.

v. If the VRF system requires a charge adjustment more frequently to maintain stable operation, the VRF manufacturer shall provide additional services at no additional charge.

vi. The 15 year period shall begin on the date the equipment is commissioned or the date the building occupancy permit was issued for the area(s) served by the system – whichever date is later.

vii. This service shall be underwritten, warranted, and administered by the VRF equipment manufacturer – not the local distributor or applied representative.

viii. The selected service provider shall be mutually agreeable between the building owner (or owners agent) and must be licensed, insured, and trained to work on the VRF system. No third party service (subcontracted service) providers will be acceptable.

ix. If the service provider is not an employee of the VRF manufacturer, the service provider shall be reimbursed for services rendered directly from the manufacturer. Labor rate for services shall be paid at the prevailing union wage rate in place at the time of service.

21. VRF Systems with Onboard Alternate Operating Mode Selection Capability

a) All VRF systems equipped with field selectable Alternate Operating Modes via DIP Switch or other means, for example but not limited to, High Heat, High Ambient Cooling, High Sensible, or Enhanced Efficiency selections. Performance using the proposed field selected Alternate Operating Mode shall be tested using AHRI Standard 1230 and published in the AHRI Directory.

b) Acceptable Alternate Operating Modes must ship with all models of the VRF product offering and must be factory embedded. Custom factory or field modifications to factory provided algorithms created to meet scheduled requirements are not acceptable.

c) Provide a copy of instructions required to set the Alternate Operation Mode with the initial submittal.

d) For systems that provide field selectable Alternate Operating Modes, ALL technical data provided in the submittal data sheets showing product rated condition performance data, must also provide separate data sheets that show product performance data at each of the field selectable Alternate Operating Modes available. Capacity, power input, and acoustic performance data for each mode offered shall be reported separately. Mixing of ODU, IDU, or VRF system performance capability operating in one mode with for example the power consumption, sound power rating, or electrical requirements of the same system operating in another mode is not acceptable.

E. Field Supplied Refrigerant Piping Design Parameters

1. The outdoor unit shall be capable of operating at an elevation difference of up to 360 feet above or below the lowest or highest indoor unit respectively without the requirement of field installed subcooler or other forms of performance enhancing booster devices.

2. The outdoor unit shall be capable of operating with up to 3280 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.

3. The outdoor unit shall be capable of operating with up to 656 actual feet or 738 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and farthest indoor unit.

4. The piping system shall be designed with pipe expansion and contraction possibilities in mind. Required expansion devices shall be field designed, supplied and installed based on proper evaluation of the proposed piping design. In addition to these requirements, the piping system installation must conform to the VRF equipment manufacturer's published guidelines.

5. The installation of pipe hangers, supports, insulation, and in general the methods chosen to attach the pipe system to the structure must allow for expansion and contraction of the piping system and shall not interfere with that movement.

6. The elevation differences for heat recovery systems shall be:

   a) Heat recovery unit to connected indoor unit shall be 49 feet

   b) Heat recovery unit to heat recovery unit shall be 98 feet

   c) Indoor unit to indoor unit connected to same heat recovery unit shall be 49 feet

   d) Indoor unit to indoor unit connected to separate parallel piped heat recovery units shall be 131 feet.

7. The acceptable elevation difference between two series connected heat recovery units shall be 16 feet.

F. Defrost Operations

1. The outdoor unit(s) shall be provided with a minimum of 4 independent field adjustable defrost cycle algorithms to maximize the effectiveness of the defrost cycle to the local weather conditions. Intelligent Defrost shall melt accumulated frost, snow and ice from the outdoor unit heat exchanger. The defrost cycle length and sequence shall be based on outdoor ambient temperatures, outdoor unit heat exchanger temperature, and various differential pressure variables. Intelligent Heating Mode, when outdoor unit humidistat is engaged, shall extend the normal heating sequences by adjusting the outdoor unit coil target temperature to be above the ambient dew point temperature delaying the need for defrost operations, so long as heating demand is being met.

2. Smart Heating**:** This feature shall be capable of eliminating several defrost actions per day based on outdoor air temperature and humidity conditions. Smart heating shall extend the heating operation cycle by delaying the frost formation on the outdoor coil by adjusting the surface temperature to keep it above the current outdoor ambient dew point. The algorithm shall delay while maintaining indoor space temperature.

3. Defrost Mode Selection: The outdoor unit shall be provided with a minimum of three field selectable defrost operation modes: Normal, Fast, or Forced.

    a) Normal Defrost: Operation intended for use in areas of the country that experience adverse winter weather with periods of heavy winter precipitation and extremely low temperatures. This strategy shall maximize the systems heating performance and maintain operational efficiency. When the ambient temperature is either: a) above 32°F or b) below 32°F with the humidity level below 60% RH, Intelligent Defrost shall continue heating regardless of ice build-up on the coil until the quality of the heated air (i.e. discharge air temperature) decreases. At temperatures below 4°F, a defrost cycle shall occur every two hours to optimize system heating efficiency.

    b) Fast Defrost: Operation intended for use in areas of the country with mild winter temperatures and light to moderate humidity levels. The strategy minimizes defrost cycle frequency allowing frozen precipitation to build longer in between cycles. Minimum time between defrost cycles shall be 20 minutes. Intelligent Defrost shall choose between split coil/frame and full system methods based on current weather conditions to minimize energy consumption and maximize heating cycle time.

    c) Forced Defrost: Operation shall be available for the service provider to test defrost operations at any weather condition and to manually clear frozen water from the outdoor coil surfaces.

4. Defrost Method Selection: The outdoor unit shall be provided with two field selectable defrost operation methods: Split Coil/Frame and Full System. Split Coil/Frame option provides continuous heating of the occupied space during defrost operation.

    a) Split Coil/Frame method shall be available when Normal Defrost mode is selected. Split Coil method shall be available on all Heat Pump and Heat recovery single-frame VRF systems. Split Frame defrost shall be available on all Heat Pump and Heat recovery multi-frame outdoor units.

    b) Split Coil method shall remove ice from the bottom half of the outdoor unit coil first for a maximum time of six minutes, then the top half for a maximum of six minutes. Next the bottom coil shall be heated again for an additional three minutes to remove any frozen water that may have dripped onto the lower coil during the top coil defrost operation.

    c) When Split Coil/Frame method is selected, a Full System defrost shall occur every 1-9 (field selectable) defrost cycles to assure 100% of the frozen precipitation has been removed to maintain efficient performance.

    d) Full System method shall be available as a field selectable option. All outdoor units located in areas of the country where large volumes of frozen precipitation are common, the commissioning agent shall be able to select the Full System only defrost method.

5. Indoor Unit Fan Operation During Defrost

    a) During partial defrost operation indoor units operating in cooling or dry mode shall continue normal operation.

    b) During partial defrost operation, indoor units that are commissioned with fans set for continuous operation shall maintain normal fan speed unless the leaving air temperature drops, then the fan speed will be reduced to low speed for the remainder of the defrost cycle.

    c) During full system defrost operation indoor unit fans will cycle off and remain off during the remainder of the defrost cycle.

G. Oil Management

1. The system shall utilize a high pressure oil return system to ensure a consistent film of oil on all moving compressor parts at all points of operation. Oil is returned to compressor through a separate high pressure oil injection pipe directly into the oil sump. Oil returned to the compressor via the suction port of the compressor shall not be allowed.
2. Each compressor shall be provided with a high efficiency independent centrifugal cyclone type oil separator, designed to extract oil from the oil/refrigerant gas stream leaving the compressor.
3. The system shall have an oil level sensor in the compressor to provide direct oil level sensing data to the main controller. The sensor shall provide data to main outdoor unit PCB to start oil return mode and balance oil levels between multiple compressors.
4. The system shall only initiate an oil return cycle if the sensed oil level is below oil level target values as determined by the microprocessor. The system shall display an error if the oil sensor signals low oil level for a period of 130 minutes or longer.
5. A default oil return algorithm shall automatically initiate the oil return mode if the system detects a failure of the oil sump sensor. A fault code shall be reported by the system.
6. Timed oil return operations or systems that do not directly monitor compressor oil level shall not be permitted.
7. Indoor Unit Fan Operation during Oil Return Cycle

    a) During oil return cycle indoor units operating in cooling or dry mode shall continue normal operation.

    b) During oil return, indoor units that are commissioned with fans set for continuous operation shall maintain normal fan speed unless the leaving air temperature drops, then the fan speed will be reduced to low speed for the remainder of the oil return cycle.

    c) During oil return cycle indoor unit fans will cycle off and remain off during oil return cycle while operating in all modes.

H. Fan and Motor Assembly

1. 6 ton frames shall be equipped with one direct drive variable speed propeller fan with Brushless Digitally Controlled (BLDC) motor with a vertical air discharge.
2. 8 to 20 ton frames shall be equipped with two direct drive variable speed propeller fan(s) with BLDC motor(s) with a vertical air discharge.

3. The fan(s) blades shall be made of Acrylonitrile Butadiene Styrene (ABS) material and incorporate biomimetic technology to enhance fan performance and reduce fan generated noise.
4. The fan(s) motor shall be equipped with permanently lubricated bearings.
5. The fan motor shall be variable speed with an operating speed range of 0-1150 RPM cooling mode and 0-1150 RPM heating mode.
6. The fan shall have a guard to help prevent contact with moving parts.
7. The cabinet shall have option to redirect the discharge air direction from vertical to horizontal with the addition of optional factory provided air guides.
8. The fan controller shall have a DIP switch setting to raise external static pressure of the fan up to 0.32 inch of W.C. to accommodate ducted installations.
9. The fan control shall have a function setting to remove excess snow automatically.
10. The fan control shall have a function setting to remove access dust and light debris from the outdoor unit and coil.

I. Cabinet

1. Outdoor unit cabinet shall be made of 20 gauge galvanized steel with a weather and corrosion resistant enamel finish. Outdoor unit cabinet finish shall be tested in accordance with ASTM B-117 salt spray surface scratch test (SST) procedure for a minimum of 1000 hours.
2. Cabinet weights and foot prints shall vary between 430 lbs., 7.61 sq. ft. (1.27 sq. ft. per ton), for 6 ton cabinet to 666 lbs., 10.14 sq. ft. (.51 sq. ft. per ton), for 20 ton cabinet for single cabinet configurations. The front panels of the outdoor units shall be removable type for access to internal components.
3. A smaller service access panel, not larger than 7” x 7” and secured by a maximum of (2) screws, shall be provided to access the following:
    a) Service tool connection
    b) DIP switches
    c) Auto addressing
    d) Error codes
    e) Main microprocessor
    f) Inverter PCB
4. The cabinet shall have piping knockouts to allow refrigerant piping to be connected at the front, right side, or through the bottom of the unit.
5. The cabinet shall have a factory installed coil guard.

J. Outdoor Unit Coil

1. Outdoor unit coil shall be designed, built and provided by the VRF outdoor unit manufacturer.

2. The outdoor unit coil for each cabinet shall have lanced aluminum fins with a maximum fin spacing of no more than 17 Fins per Inch (FPI). All the outdoor unit coils shall be a 2 or 3 rows consisting of staggered tubes for efficient air flow across the heat exchanger

3. Outdoor unit coil shall be comprised of aluminum fins mechanically bonded to copper tubing with inner surfaces having a riffling treatment to expand the total surface of the tube interior

4. The aluminum fin heat transfer surfaces shall have factory applied corrosion resistant Black Fin coating. The copper tubes shall have inner riffling to expand the total surface of the tube interior.

    a) ISO 21207 Salt Spray Test Method B – 1500 hours

    b) ASTM B-117 Acid Salt Test – 900 hours

    c) The Black Fin coating shall be certified by Underwriters Laboratories and per ISO 21207. The above conditions shall establish the minimum allowable performance which all alternates must comply.

5. Variable Path Heat Exchanger: System shall have a variable flow and path outdoor heat exchanger function to vary the refrigerant flow and volume and path. Control of the variable path circuits shall be based on system operating mode and operating conditions as targeted to manage the coil heat transfer capacity and efficiency. The variable path heat exchanger technology shall be provided to maintain stable refrigeration cycle operation during mild weather conditions and maintain a robust hot vapor temperature system head pressure that delivers “gas-furnace leaving air temperature” from the indoor unit at sub-zero outdoor air temperature down to minus (-) 22°F.The outdoor unit coil, all indoor units and pipe network shall be field tested to a minimum pressure of 550 psig.

K. Compressor(s)

1. Compressor shall be designed and assembled by the VRF manufacturer specifically for use in the air source VRF product line. Third party manufactured, branded, or designed to the VRF system’s OEM specifications by a third party manufacturer shall not be acceptable.

2. Compressor shall be a hermetic, high-side shell (HSS), commercial grade, compliant scroll direct-drive design.

    a) Compressor Design: The compressor design shall be of the high pressure shell scroll type where the internal pressure below the suction valves of the compressor shall be at the same high pressure and high temperature. The motor shall be cooled by high pressure gas at temperatures above saturation conditions and minimize the mixing of refrigerant liquid with oil in the sump. The system shall employ a high pressure oil return method returning recovered oil from the oil separator directly into the oil sump of the compressor; oil shall not be allowed to return via the suction line. Bearing surfaces are continually coated with oil. The compressor shall employ an Aero-bearing constructed with high lubricity materials increasing operation time in case of low sump oil level. Compressor shall have a nominal operating range from 12Hz to 150 Hz.

3. The fixed and oscillating compressor scroll components shall be made of high grade (GC25) or denser steel material. All scrolls shall be heat treated and tempered.

4. The oscillating scroll shall be finely machined and polished. PVE refrigerant oil shall be used as the sole liquid used to maintain a seal between the high and low sides of the compression chamber. Compressors that requires the use of any type of mechanical or wearable sealant material between the moving surfaces of the compression chamber is NOT ACCEPTABLE.

5. Vapor Injection: System shall have a medium pressure gas vapor injection function employed in the heating and cooling modes to increase system capacity when the outdoor ambient temperatures are low and lower compressor lift when temperatures are high. The compressor vapor injection flow amount shall be controlled by the vapor injection sub-cooling algorithm reset by discharge gas temperatures of the compressor.

6. Bearing surfaces shall be coated with Teflon® equal. Bearings shall be lubricated using a constant flow of PVE refrigerant oil to the bearing surfaces The film of oil separating the crankshaft journals and bearing surfaces shall be consistent at all times the crankshaft is in motion and shall be maintained irrelevant of crankshaft rotational speed.

7. An internal, integrated, mechanically driven gear pump shall draw oil from the compressor sump reservoir, pressurize the oil and inject the oil directly to the crankshaft journals maintaining a consistent film of oil between all moving parts. Auxiliary, indirect, or electronically driven pumps are not acceptable.

8. The viscosity property of the PVE oil in the compressor sump shall be maintained irrelevant or compressor operation and the surrounding ambient temperature.

    a) The compressor shall be equipped with an external thermally protected electric crankcase heater that is automatically activated only when the ambient temperature is below freezing and the compressor is not running to maintain the temperature of the oil in the sump above the refrigerant boiling point.

    b) During stable operation, irrelevant of ambient air temperature outside the water source unit, the temperature of refrigerant vapor in contact with the surface of the oil in the compressor sump shall be maintained above 140°F to prevent foaming and to eliminate refrigerant from mixing with the oil degrading the viscosity of the oil in the sump.

9. The compressor motor shall be designed to operate at high temperatures.

    a) The motor winding insulation shall be designed to operate continuously at a minimum temperature of 180°F without deterioration.

    b) The motor cooling system shall be designed to maintain acceptable operational temperature at all times and in all conditions using high pressure, hot refrigerant vapor as motor coolant.

10. Inverter Compressor Controller(s)

    a) Each compressor shall be equipped with a dedicated inverter compressor drive. The control of multiple compressors using a single drive is not acceptable.

    b) The inverter drive shall vary the speed of the compressor crankshaft between zero (0) Hz and 140 Hz.

c) The inverter driver controller shall be matched with the physical properties of the compressor. The drive shall be manufactured by the VRF air source unit manufacturer. The inverter drive and matching compressor shall have been thoroughly tested as a matched pair. The inverter drive shall be programmed to avoid operating the compressor at any speed that results in harmonic vibration, nuisance noise, or mechanical damage to either the driver or the compressor with power provided that is within the tolerance specification.

d) The compressor inverter drive assembly and software must be designed, manufactured, and supplied by the VRF product manufacturer. Third party branded inverter driver hardware and/or driver software or inverter driver hardware and/or software provided by a third party manufacturer to meet OEM specifications of the VRF water source manufacturer will not acceptable.

e) All inverter drive hardware or software manufactured in, is a product of, or sourced from China, or using a broker or third party provider as an intermediary that obtains the product from CHINA shall not be acceptable.

11. Compressor(s)

a) Each 6, 8, 10 ton frames shall be equipped with a single hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressor.

b) 12, 14, 16, 18 and 20 ton frames shall be equipped with dual hermetically sealed, inverter driven, High Side Shell (HSS) scroll compressors.

c) Each inverter driven, HSS scroll compressor shall be capable of operating from 12 Hz up to 150 Hz in any and all modes (cooling, heating or simultaneous modes).

d) The compressor shall be designed for a separate port for oil to be directly returned to the compressor oil sump.

e) The compressor bearing(s) shall have Teflon™ coating and shall be an aero type design using High lubricity materials.

f) The compressor(s) shall be protected with:

i. High Pressure switch

ii. Over-current /under current protection

iii. Oil sump sensor

iv. Phase failure

v. Phase reversal

vi. Compressor shall be capable of receiving injection of medium pressure gas at a point in the compression cycle where such injection shall allow a greater mass flow of refrigerant at lower outdoor ambient and achieving a higher heating capability. The VRF outdoor unit shall have published performance data for heating mode operation down to -22°F on both heat pump and heat recovery systems.

g) Standard, non-inverter driven compressors shall not be permitted nor shall a compressor without vapor injection or direct sump oil return capabilities.

L. Operational Sound Levels

1. The compressor(s) shall be mounted on rubber isolation grommets. Compressor shall ship with removable clamps that secure the compressor in place while transported. The installing contractor shall remove and discard (or optionally adjust the clamps to allow the isolator to properly function) the clamps prior to commissioning the water source unit.

2. Each single frame outdoor unit shall be rated with an operational sound pressure level not to exceed as listed on below chart when tested in an anechoic chamber under ISO 3745 standard at the highest field selectable heating operating modes available. Such documentation shall be presented in all submittals, manufactures who elect to rate their equipment at other than tested in an anechoic chamber under ISO 3745 standard at the highest field selectable heating operating modes available and the highest field selectable conditions shall not be allowed.

3. A field setting shall be available to program the outdoor unit to reduce sound levels at night, when desired, to a selectable level while still able to meet building load requirement. This mode is available in both cooling and heating modes.

M. Sensors

1. Each outdoor unit module shall have:

a) Suction temperature sensor

b) Discharge temperature sensor

c) Oil level sensor

d) High Pressure sensor

e) Low Pressure sensor

f) Outdoor temperature sensor

g) Outdoor humidity sensor

h) Outdoor unit heat exchanger temperature sensors

N. Wind Load Installations for Outdoor Units

1. Provide Florida wind Load Installation Drawings that meet the requirements of the 2017 Florida Building Code, 6th Edition and ASCE Standard 7-2010 with submittal.

O. Seismic Installations

1. Provide with submittal: 1) OSHPD Special Seismic Certification Preapproval (OSP) documents for certified product list of VRF equipment to be installed in high seismic risk areas. 2) Equipment installation documents in conformance with CBC 2013, 2016 and 2019 California Building Code and IBC 2012, 2015 and 2018 International Building Code.

P. Warranty

1. Limited Warranty Period

a) STANDARD ONE-YEAR PARTS WARRANTY FOR A QUALIFIED SYSTEM - The Part(s) of a qualified System, including the compressor, are warranted for a period (the “Standard Parts Warranty Period”) ending on the earlier to occur of one (1) year after the date of original installation, or eighteen (18) months from the date of manufacture.

b) ADDITIONAL SIX (6) YEAR COMPRESSOR PART WARRANTY - The Compressor is warranted for an additional six (6) year period after the end of the applicable Standard Part Warranty Period (the “Compressor Warranty Period”).

2. Extended Warranty

a) The Standard Warranty Period and the Compressor Warranty Period are extended to a total of ten (10) years (the “Extended Warranty Period”) for qualified Systems that have been (a) commissioned by a party that has completed the current Training Requirements, (b) such commissioning is pursuant to LG’s current published instructions, and (c) the System commissioning results and supporting documents are entered correctly into LG’s online commissioning system. Commissioning of a System requires one (1) hour of LG Monitoring View (LGMV) data. Commissioning results must be entered into LG’s online commissioning system within sixty (60) days of System startup.

Part 4. Indoor Units

4.01 Ducted – Mid Static

A. General

1. Unit shall be manufactured by LG.
2. Unit shall be designed to be installed for indoor application.
3. Unit shall be designed to mount fully concealed above the finished ceiling.
4. Unit shall have opening to supply air from front horizontal and a dedicated rear horizontal return.
5. The supply air shall be flanged for field installed ductwork that shall not exceed the external static pressure limitation of the unit.

B. Casing/Panel

1. Unit case shall be manufactured using galvanized steel plate.
2. The cold surfaces of the unit shall be covered internally with a coated polystyrene insulating material.
3. The cold surfaces of the unit shall be covered externally with sheet insulation made of Ethylene Propylene Diene Monomer (M-Class) (EPDM)
4. The external insulation shall be plenum rated and conform to ASTM Standard D-1418.
5. Unit shall be provided with hanger brackets designed to support the unit weight on four corners.
6. Hanger brackets shall have pre-punched holes designed to accept field supplied, all thread rod hangers.

C. Cabinet Assembly

1. Unit shall have horizontal supply air discharge outlets and a return air inlet
2. Unit shall be equipped with factory installed temperature thermistors for:
    a) Return air
    b) Refrigerant entering coil
    c) Refrigerant leaving coil
3. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
4. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
5. Unit shall have the following functions as standard:
    a) Self-diagnostic function
    b) Auto addressing
    c) Auto restart function
    d) Auto changeover function (Heat Recovery system only)
    e) Auto operation function
    f) Child lock function
    g) Forced operation
    h) Dual thermistor control
    i) Sleep mode
    j) External static pressure (ESP) control
    k) Dual set point control
    l) Multiple aux heater applications
    m) Filter life timer
    n) External on/off input
    o) Wi-Fi compatible
    p) Auto fan operation
    q) Leak detection logic

D. Fan Assembly

1. The unit shall have two direct drive Sirocco fans made of high strength ABS GP-2200 polymeric resin.

2. The fan impeller shall be statically and dynamically balanced.
3. The fans shall be mounted on a common shaft.
4. The fan motor is Brushless Digitally commutated (BLDC) with permanently lubricated and sealed ball bearings.
5. The fan motor shall include thermal, overcurrent and low RPM protection.
6. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
7. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm that provides a minimum of three pre-programed fan speeds, each setting is also adjustable by field setting to compensate for a limited amount of additional resistance to airflow by adjusting the RPM of the fan motor.
8. In cooling mode, the indoor fan shall have the following settings; Low, Med, High, and Auto.
9. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.
10. Each of the settings can be field adjusted from the factory setting (RPM/ESP).
11. Unit shall be designed for high speed air volume against an external static pressure of up to 0.98” water gauge, model dependent.

E. Filter Assembly

1. The return air inlet shall have a factory supplied removable, washable filter. MERV 13 filter rack is available as an option, model dependent.
2. The filter access shall be from the rear of the unit.

F. Coil Assembly

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. The copper tubing shall have inner grooves to expand the refrigerant contact surface for high efficiency heat exchanger operation.
3. Unit shall have a minimum two to three row coil, 19-21 fins per inch.
4. Unit shall have a factory supplied condensate drain pan below the coil constructed of HIPS (high impact polystyrene resin).
5. Unit shall include an installed and wired condensate drain lift pump capable of providing minimum 27.5 inch lift from bottom surface of the unit. The unit drain pan is supplied with a secondary drain port/plug allowing the pan to be gravity drained and serviced.
6. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan, model dependent.
7. Unit shall have provision of 45° flare refrigerant pipe connections.
8. The coil shall be factory pressure tested at a minimum of 550 psig.
9. All refrigerant piping from outdoor unit to indoor unit shall be field insulated. Each pipe should be insulated separately. Thickness and heat transfer characteristics shall be determined by the design engineer and shall meet all code requirements.

G. Microprocessor Control

1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system with or without the use of a wall mounted controller. The unit shall have a factory mounted return air thermistor for use as a space temperature control device. All operating parameters except scheduling shall be stored in non-volatile memory resident on the microprocessor. The microprocessor shall provide the following functions, self-diagnostics, auto re-start after a power failure and a test run mode.

2. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, two core, stranded, twisted, and shielded communication cable.

3. The unit controls shall operate the indoor unit using one of the five operating modes:

   a) Auto changeover (Heat Recovery System only)

   b) Heating

   c) Cooling

   d) Dry

   e) Fan only

4. The unit shall be able to operate in either cooling or heating mode for testing and/or commissioning.

5. The unit shall be able to operate with the fan turned off during system cooling thermal off.

6. The unit shall be able to operate with a continuous fan setting.

7. The unit shall have adjustable, multi-step cooling and heating mode thermal on/off temperature range settings.

8. The system shall include a product check function to access and display indoor unit type and capacity from a wired programmable thermostat controller.

H. Electrical

1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz).

2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

I. Controls

1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS-485 daisy chain.

J. Seismic Installations

1. Provide with submittal: 1) OSHPD Special Seismic Certification Preapproval (OSP) documents for certified product list of VRF equipment to be installed in high seismic risk areas. 2) Equipment installation documents in conformance with CBC 2013, 2016 and 2019 California Building Code and IBC 2012, 2015 and 2018 International Building Code.

K. Warranty

1. Please refer to the respective outdoor unit for applicable warranty.

4.02 **Ceiling Cassette – 4 Way (2’ x 2’)**

A. General

1. Unit shall be manufactured by LG.
2. Unit shall be designed to be installed for indoor application.
3. Unit shall be designed to mount recessed in the ceiling and has a surface mounted panel on the bottom of the unit.
4. The unit shall be available in a 2’ x 2’ chassis.

B. Casing/Panel

1. Unit case shall be manufactured using galvanized steel plate.
2. The unit panel and grille shall be made of a white Acrylonitrile Butadiene Styrene (ABS) polymeric resin.
3. The panel shall have a tapered trim edge, and a hinged, spring clip (screw-less) return air filter-grille door.
4. Unit shall be provided with metal ears designed to support the unit weight on four corners.
5. Ears shall have pre-punched holes designed to accept field supplied all thread rod hangers.
6. Unit shall be supplied with snap off access panels to facilitate leveling of unit without removing the panel.

C. Cabinet Assembly

1. Unit shall have four supply air outlets and one return air inlet.
2. The supply air outlet shall be through four directional slot diffusers each equipped with dual independent oscillating motorized guide vanes designed to change the airflow direction.
3. The panel vanes shall have a discharge range of motion of 10° - 85° in an up/down direction with capabilities of locking the vanes.
4. The unit shall have a guide vane algorithm designed to sequentially change the predominant discharge airflow direction in a counterclockwise pattern.
5. Dual guide vanes shall provide airflow in all directions.
6. Unit shall be equipped with factory installed temperature thermistors for:
    a) Return air
    b) Refrigerant entering coil
    c) Refrigerant leaving coil
7. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
8. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
9. The unit shall have factory designated branch duct knockouts on the unit case.
10. The unit shall have provision of fresh air ventilation through a knock-out on the cabinet.
11. The branch duct knockouts shall have the ability to duct up to 1/2 the unit airflow capacity.

12. The branch duct cannot be ducted to another room.
13. Unit shall have the following functions as standard:
    a) Self-diagnostic function
    b) Auto addressing
    c) Auto restart function
    d) Auto changeover function (Heat Recovery system only)
    e) Auto operation function
    f) Child lock function
    g) Forced operation
    h) Dual thermistor control
    i) Sleep mode
    j) Dual set point control
    k) Multiple aux heater applications
    l) Filter life timer
    m) External on/off input
    n) Wi-Fi compatible
    o) Multiple fan operation settings
    p) Multiple airflow control modes
    q) Leak detection logic

Q. Fan Assembly

14. The unit shall have a single, direct-drive turbo fan made of high strength ABS HT-700 polymeric resin.
15. The fan impeller shall be statically and dynamically balanced.
16. The fan motor is Brushless Digitally commutated (BLDC) with permanently lubricated and sealed ball bearings.
17. The fan motor shall include thermal, overcurrent and low RPM protection.
18. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
19. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm that provides a minimum of four pre-programed fan speeds in the heating mode and fan only mode and five speeds in the cooling mode. The fan speed algorithm provides a field selectable fixed speed.
20. A field setting shall be provided to vary air throw pattern to compensate for high ceiling installations.

21. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, Super high, Power Cool, and Auto.

22. In heating mode, the indoor fan shall have the following settings: Low, Med, High, Super high and Auto.

23. Unit shall have factory installed dual motorized louvers to provide flow of air in up and down direction for uniform airflow.

D. Filter Assembly

1. The return air inlet shall have a factory supplied removable, washable filter.

2. The filter access shall be from the bottom of the unit without the need for tools.

E. Coil Assembly

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.

2. The copper tubing shall have inner grooves to expand the refrigerant contact surface for high efficiency heat exchanger operation.

3. Unit shall have a 5mm dia., three row coil, with 18 columns and 22 fins per inch.

4. Unit shall have a factory supplied condensate drain pan below the coil constructed of EPS (expandable polystyrene resin).

5. Unit shall include an installed and wired condensate drain lift pump capable of providing minimum 27.5 inch lift from bottom surface of the unit.

6. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan.

7. Unit shall have provision of 45° flare refrigerant pipe connections.

8. The coil shall be factory pressure tested at a minimum of 550 psig.

9. All refrigerant piping from outdoor unit to indoor unit shall be field insulated. Each pipe should be insulated separately. Thickness and heat transfer characteristics shall be determined by the design engineer and shall meet all code requirements.

F. Microprocessor Control

1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.

2. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, two core, stranded, twisted and shielded communication cable.

3. The unit controls shall operate the indoor unit using one of the five operating modes:

a) Auto changeover (Heat Recovery System only)

b) Heating

c) Cooling

d) Dry

e) Fan only

4. The unit shall be able to operate in either cooling or heating mode for testing and/or commissioning.

5. The unit shall be able to operate with the fan turned off during system cooling thermal off.

6. The unit shall have adjustable, multi-step cooling and heating mode thermal on/off temperature range settings.

7. The system shall include a product check function to access and display indoor unit type and capacity from a wired programmable thermostat controller.

8. Unit shall have a field settable method to choose auto fan speed change operation based on mode of operation, on/off fan operation based on mode of operation, or continuous minimum set fan speed operation.

G. Electrical

1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz).

2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

H. Controls

1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS-485 daisy chain.

I. Optional Accessories

1. Unit shall have the following optional accessories available:

a) Premium panel with air purification kit

b) Floor temperature sensor

c) Human detection sensor

d) Ventilation flange and kit

J. Seismic Installations

1. Provide with submittal: 1) OSHPD Special Seismic Certification Preapproval (OSP) documents for certified product list of VRF equipment to be installed in high seismic risk areas. 2) Equipment installation documents in conformance with CBC 2013, 2016 and 2019 California Building Code and IBC 2012, 2015 and 2018 International Building Code.

K. Warranty

1. Please refer to the respective outdoor unit for applicable warranty.

4.03 **Ducted – High Static**

A. General

1. Unit shall be manufactured by LG.

2. Unit shall be designed to be installed for indoor application.
3. Unit shall be designed to mount fully concealed above the finished ceiling.
4. Unit shall have opening to supply air from front horizontal and a dedicated rear horizontal return.
5. The supply air shall be flanged for field installed ductwork that shall not exceed the external static pressure limitation of the unit.

B. Casing/Panel

1. Unit case shall be manufactured using galvanized steel plate.
2. The cold surfaces of the unit shall be covered internally with a coated polystyrene insulating material.
3. The cold surfaces of the unit shall be covered externally with sheet insulation made of Ethylene Propylene Diene Monomer (M-Class) (EPDM)
4. The external insulation shall be plenum rated and conform to ASTM Standard D-1418.
5. Unit shall be provided with hanger brackets designed to support the unit weight on four corners.
6. Hanger brackets shall have pre-punched holes designed to accept field supplied, all thread rod hangers.

C. Cabinet Assembly

1. Unit shall have horizontal supply air discharge outlets and a return air inlet
2. Unit shall be equipped with factory installed temperature thermistors for:
    a) Return air
    b) Refrigerant entering coil
    c) Refrigerant leaving coil
3. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
4. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.
5. Unit shall have the following functions as standard:
    a) Self-diagnostic function
    b) Auto addressing
    c) Auto restart function
    d) Auto changeover function (Heat Recovery system only)

e) Auto operation function

f) Child lock function

g) Forced operation

h) Dual thermistor control

i) Sleep mode

j) External static pressure (ESP) control

k) Dual set point control

l) Multiple aux heater applications

m) Filter life timer

n) External on/off input

o) Wi-Fi compatible

p) Auto fan operation

q) Leak detection logic

D. Fan Assembly

1. The unit shall have two direct drive Sirocco fans made of high strength ABS GP-2200 polymeric resin.
2. The fan impeller shall be statically and dynamically balanced.
3. The fans shall be mounted on a common shaft.
4. The fan motor is Brushless Digitally commutated (BLDC) with permanently lubricated and sealed ball bearings.
5. The fan motor shall include thermal, overcurrent and low RPM protection.
6. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
7. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm that provides a minimum of three pre-programed fan speeds, each setting is also adjustable by field setting to compensate for a limited amount of additional resistance to airflow by adjusting the RPM of the fan motor.
8. In cooling mode, the indoor fan shall have the following settings; Low, Med, High, and Auto.
9. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.
10. Each of the settings can be field adjusted from the factory setting (RPM/ESP).

11. Unit shall be designed for high speed air volume against an external static pressure of up to 0.98” water gauge, model dependent.

E. Filter Assembly

1. The return air inlet shall have a factory supplied removable, washable filter. MERV 13 filter rack is available as an option, model dependent.
2. The filter access shall be from the rear of the unit.

F. Coil Assembly

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. The copper tubing shall have inner grooves to expand the refrigerant contact surface for high efficiency heat exchanger operation.
3. Unit shall have a minimum two to three row coil, 19-21 fins per inch.
4. Unit shall have a factory supplied condensate drain pan below the coil constructed of HIPS (high impact polystyrene resin).
5. Unit shall include an installed and wired condensate drain lift pump capable of providing minimum 27.5 inch lift from bottom surface of the unit. The unit drain pan is supplied with a secondary drain port/plug allowing the pan to be gravity drained and serviced.
6. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan, model dependent.
7. Unit shall have provision of 45° flare refrigerant pipe connections.
8. The coil shall be factory pressure tested at a minimum of 550 psig.
9. All refrigerant piping from outdoor unit to indoor unit shall be field insulated. Each pipe should be insulated separately. Thickness and heat transfer characteristics shall be determined by the design engineer and shall meet all code requirements.

G. Microprocessor Control

1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system with or without the use of a wall mounted controller. The unit shall have a factory mounted return air thermistor for use as a space temperature control device. All operating parameters except scheduling shall be stored in non-volatile memory resident on the microprocessor. The microprocessor shall provide the following functions, self-diagnostics, auto re-start after a power failure and a test run mode.
2. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, two core, stranded, twisted, and shielded communication cable.
3. The unit controls shall operate the indoor unit using one of the five operating modes:
    a) Auto changeover (Heat Recovery System only)

b) Heating

c) Cooling

d) Dry

e) Fan only

4. The unit shall be able to operate in either cooling or heating mode for testing and/or commissioning.

5. The unit shall be able to operate with the fan turned off during system cooling thermal off.

6. The unit shall be able to operate with a continuous fan setting.

7. The unit shall have adjustable, multi-step cooling and heating mode thermal on/off temperature range settings.

8. The system shall include a product check function to access and display indoor unit type and capacity from a wired programmable thermostat controller.

H. Electrical

1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz).

2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

I. Controls

1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS-485 daisy chain.

J. Seismic Installations

1. Provide with submittal: 1) OSHPD Special Seismic Certification Preapproval (OSP) documents for certified product list of VRF equipment to be installed in high seismic risk areas. 2) Equipment installation documents in conformance with CBC 2013, 2016 and 2019 California Building Code and IBC 2012, 2015 and 2018 International Building Code.

K. Warranty

1.Please refer to the respective outdoor unit for applicable warranty.

4.04 **Ducted – Vertical/Horizontal Air Handling Unit**

A. General

1. Unit shall be manufactured by LG.

2. Unit shall be factory assembled, wired, piped and run tested.

3. Unit shall be designed to be installed for indoor application.

4. Unit shall be designed to mount fully concealed behind the wall, in a closet or above the finished ceiling.

5. The unit case shall be designed to accept an internal, optional LG electric strip heater mounted in the reheat position, available in 5, 10, 15, and 20 KW capacities for field installation per installation instructions.

6. The supply air shall be flanged for field installed ductwork that shall not exceed the external static pressure limitation of the unit.

B. Casing/Panel

1. Unit case shall be manufactured using 22-gauge Pre Coated Metal (PCM).

2. The external surface shall be finished with a high gloss baked enamel finish.

3. The finish color shall be morning fog.

4. The cold surfaces of the unit shall be internally insulated with 1/2 inch foil faced polystyrene fiber insulation.

5. The inside surface of fan assembly door access panel shall be treated with 1/2 inch polystyrene fiber insulation, encapsulated on both sides.

6. The access panel shall be sealed along the edges with reinforced foil faced covering to prevent deterioration caused by panel removal.

7. All the access panels shall be provided with gasket seals to minimize air leakage.

8. The external insulation shall be plenum rated and conform to ASTM Standard D-1418.

C. Cabinet Assembly

1. The unit shall be designed to operate in the vertical (up flow) configuration or horizontal (left) end discharge.

2. Unit shall, in the vertical position, have opening for supply air from top with a dedicated bottom vertical return and in the horizontal position supply air shall be from the left end with the return air from the right end.

3. Unit shall be equipped with factory installed temperature thermistors for:

    a) Return air

    b) Refrigerant entering coil

    c) Refrigerant leaving coil

4. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.

5. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit.

6. Unit shall have the following functions as standard:

    a) Self-diagnostic function

b) Auto addressing

c) Auto restart function

d) Auto changeover function (Heat Recovery system only)

e) Auto operation function

f) Auto clean function

g) Child lock function

h) Forced operation

i) Dual thermistor control

j) Sleep mode

k) External static pressure (ESP) control

l) Dual set point control

m) Aux heater applications

n) Filter life timer

o) External on/off control input

p) Wi-Fi compatible

q) Auto fan operation

r) Refrigerant Refrigerant Leak detection logic

D. Fan Assembly

1. The unit shall have an integral fan assembly consisting of galvanized steel housing and forward curve fan wheel.
2. The fan motor is Brushless Digitally commutated (BLDC) with permanently lubricated and sealed ball bearings.
3. The fan motor shall include thermal, overcurrent and low RPM protection.
4. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
5. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm that provides a minimum of three pre-programed fan speeds. Each setting is also adjustable by field setting to compensate for a limited amount of additional resistance to airflow by adjusting the RPM of the fan motor.
6. In cooling mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.

7. In heating mode, the indoor fan shall have the following settings: Low, Med, High, and Auto.
8. Each of the settings can be field adjusted from the factory setting (RPM/ESP).
9. Unit shall be designed for high speed air volume against an external static pressure of up to 1.0” water gauge model dependent.

E. Filter Assembly

1. The unit comes with a filter rack capable of accepting a field supplied 16” x 20” x 1” filter cartridge
2. The filter rack shall be equipped with guides to keep filter centered in the rack.
3. The filter access shall be from the front of the unit without removing coil or fan area access panel.
4. The filter access door shall be fitted with thumb screws that can be removed without the use of any tool.

F. Coil Assembly

1. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
2. The copper tubing shall have inner grooves to expand the refrigerant contact surface for high efficiency heat exchanger operation.
3. Unit shall have minimum two to three row coil, 18 fins per inch.
4. Unit shall have a factory supplied condensate drain pan below the coil constructed of HIPS (high impact polystyrene resin).
5. Unit shall be designed for gravity drain.
6. The unit shall have a secondary drain port plug for overflow.
7. Unit shall have provision of 45° flare refrigerant pipe connections.
8. The coil shall be factory pressure tested at a minimum of 550 psig.
9. All refrigerant piping from outdoor unit to indoor unit shall be field insulated. Each pipe should be insulated separately. Thickness and heat transfer characteristics shall be determined by the design engineer and shall meet all code requirements.

G. Microprocessor Control

1. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system with or without the use of a wall mounted controller. The unit shall have a factory mounted return air thermistor for use as a space temperature control device. All operating parameters except scheduling shall be stored in non-volatile memory resident on the microprocessor. The microprocessor shall provide the following functions, self-diagnostics, auto re-start after a power failure and a test run mode

2. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, two core, stranded, twisted, and shielded communication cable.
3. The unit controls shall operate the indoor unit using one of the five operating modes:
    a) Auto changeover (Heat Recovery System only)
    b) Heating
    c) Cooling
    d) Dry
    e) Fan only
4. The unit shall be able to operate in either cooling or heating mode for testing and/or commissioning.
5. The unit shall be able to operate with the fan turned off during system cooling thermal off.
6. The unit shall be able to operate with a continuous fan setting.
7. The unit shall have adjustable, multi-step cooling and heating mode thermal on/off temperature range settings.
8. The system shall include a product check function to access and display indoor unit type and capacity from a wired programmable zone controller.

H. Electrical

1. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz).
2. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.

I. Controls

1. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS-485 daisy chain.

J. Seismic Installations

1. Provide with submittal: 1) OSHPD Special Seismic Certification Preapproval (OSP) documents for certified product list of VRF equipment to be installed in high seismic risk areas. 2) Equipment installation documents in conformance with CBC 2013, 2016 and 2019 California Building Code and IBC 2012, 2015 and 2018 International Building Code.

K. Warranty

2. Please refer to the respective outdoor unit for applicable warranty

SECTION 26 0200
ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

A. The electrical work commences with the point of electrical service where shown on the drawings and includes furnishing all material and labor for a complete electrical installation.

B. The requirements of Division 1 apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

C. The Contractor shall be responsible for construction coordination of all work described in this section with the work specified in other sections of the specifications and shown on the drawings. In advance of construction, coordinate and work out any minor problems with other trades to avoid conflicts therewith. However, if other than minor problems are encountered, bring these problems to the attention of the Architect, who will make the final decisions as to correction.
   1. All references and notations pertaining to coordination by the Contractor shall apply to construction coordination. The Architect and Engineers have, to the best of their ability, coordinated the drawing and specifications to avoid conflicts between specified equipment and space required for such, and between architectural and engineering disciplines.

1.02 DEFINITIONS

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Signal Circuit: Voltage: 0-120 Volts.

E. Low Voltage: 120-600 Volts.

F. High Voltage: Above 600 Volts.

G. Indicated: Shown on the Contract Drawings.

H. Noted: Indicated or specified elsewhere.

1.03 DIVISION OF WORK

A. Unless otherwise noted the following are provided by Division 23 0000.
   1. Motors.
   2. Electric heating and air conditioning equipment.
   3. Building energy management systems.
   4. Electrical heat tracing.
   5. Pilot and control devices for the above equipment, except conduit rough-in is work of this section.

B. Unless otherwise noted the following are provided and connected by this division and installed by Division 23 0000.
   1. Duct Smoke Detectors.

C. Power wiring and equipment connections for items above are specified in this Division. Control wiring for Division 23 0000 is installed by Division 23 0000 per the requirements of this Division. Control wiring for other divisions is installed by this division except as noted below.

D. Furnish and install any incidental work not shown or specified which can reasonably be inferred as part of the work and necessary to provide a complete and workable system.

1.04 LOCAL CONDITIONS

A. Power will be supplied by the utility company overhead electrical distribution system. Verify and comply with all power company requirements for metering, pull sections, transformer pads. Make necessary arrangements with the power company for temporary service requirements.

B. Verify and comply with all requirements of the local telephone company concerning the complete telephone system.

C. Existing Utilities: Locate and protect existing utilities and other underground work in manner which will ensure that no damage or service interruption will result from excavating and backfilling.

D. Protect property from damage which might result from excavating and backfilling.

E. Protect persons from injury at excavations by barricades, warnings, and illumination.

1.05 QUALITY ASSURANCE

A. Provide the complete electrical installation in accordance with the 2014 National Electrical Code (NFPA 70) and other applicable NFPA codes, Fire Prevention Code, Rules and Regulations for Energy Efficiency Standards for New Construction, Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities, and in accordance with applicable local does. Obtain all necessary permits and have all work inspected by appropriate authorities.

B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, products shall be labeled or listed by third party certification agencies. Standards organizations, and their abbreviations as used hereafter, include the following:
   1. American National Standards Institute, Inc. (ANSI).
   2. American Society for Testing and Materials (ASTM).
   3. Insulated Cable Engineers Association (ICEA).
   4. National Electrical Manufacturers Association (NEMA).
   5. National Fire Protection Association (NFPA).
   6. Underwriters Laboratories (UL).

1.06 SUBMITTALS

A. Make all submittals in accordance with the requirements of Division 1. Approval drawings consists of shop drawings, product data, and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

B. Provide six copies of each type of equipment material or information for installation.

C. Product data shall include, for each item, the manufacturer, manufacturer's catalog number, type of class, the rating, capacity, size, etc. Submittals shall include:
   1. Fixture Cuts.
   2. Disconnect Switches.
   3. Panelboards.
   4. Wire and Cable.
   5. Conduit and Fittings.
   6. Boxes and Covers.
   7. Fire Alarm System Equipment.
   8. Switchgear.
   9. Telephone/Intercom System.
   10. Lighting Control System.

D. Fixture Cuts: Contractor shall submit a brochure containing catalog cuts or drawings and data for all the lighting fixtures he proposes to furnish. For fixtures which the contractor proposes to substitute for those specified, he shall submit complete photometric data prepared by a recognized, approved testing laboratory, manufacturer's data sheets or drawings showing dimensions, construction, materials and finished, and when required, sample fixtures.

E. Shop Drawings: Submit for approval, detailed construction drawings for each item of fabricated equipment required for the electrical installation. All drawings shall be to scale, fully dimensioned, and provide sufficient detail to clearly indicate the arrangement of the equipment and its component parts. Construction of the equipment shown shall be revised to comply with the drawings and specifications as drawings, and the drawings submitted when requested by the Architect. Shop drawings shall be submitted for the following:
   1. Switchgear.
   2. Panelboards.

F. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

G. Substitutions and/or systems designed and manufactured by other manufacturers will be considered under the terms described for substitutions with the following exceptions:
   1. Substitutions: See Section 01 6000 - Product Requirements.
   2. Substitution requests will be considered only if received at least 10 days prior to the bid date.
   3. Substitution requests will be considered only if required submittal data is complete; see article SUBMITTALS above.
   4. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design.
   5. Contractor shall certify that the substitute system will achieve the performance specified.

1.07 DRAWINGS

A. The electrical drawings, which constitute an integral part of this contract, shall serve as the working drawings. They indicate diagrammatically the general layout of the complete electrical system, including the arrangement of feeders, circuits, outlets, switches, controls, panelboards, service equipment, fixtures, special systems, and other work. Field verifications of scale dimensions taken from the drawings are directed since actual field locations, distances and elevations will be governed by actual field conditions. Review architectural, structural, mechanical and plumbing drawings and adjust work to conform to all conditions indicated thereon. Discrepancies shown on different plans or between plans and actual field conditions, or between plans and specifications, shall promptly be brought to the attention of the Architect for a decision prior to installation of equipment in question. If discrepancies are not brought to the attention of the Architect prior to installation of said equipment the Contract, if so directed, will move, remove or modify said equipment at no additional cost.

1.08 RECORD DRAWINGS

A. Furnish record drawings in accordance with the requirements of Division 1. Record drawings consist of submittal data as listed above, operation and maintenance data, and as built drawings. Record drawings are to reflect the final installation including any changes during approval, manufacturing tests, and installation.

B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, three-ring binder(s) located in a hinged metal cabinet in the main electrical room and shall include:
   1. Title page with project name; installing contractor's name, address, and telephone number; date of installation and warranty period.
   2. Index sheet.
   3. Complete manufacturers operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.

C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.

D. Submit the results of any test required in the individual equipment sections.

1.09 SERIES CONNECTED RATINGS

A. Combinations for series connected interrupted ratings shall be recognized by Underwriters Laboratories and shall appear in the Recognized Component Directory under the “Circuit Breakers-Series Connected” product category DKSY2. Current limiting circuit breakers shall allow the use of branch circuit breakers with lower interrupting capacities on systems capable of delivering fault currents which are higher than these capacities.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Ship products to the job site in their original packaging. Receive and store products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.

B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide only new products of the manufacturer's latest design.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The complete installation is to be accomplished by skilled electrical tradesmen with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality; sub-standard work will be rejected.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Contract Drawings and specifications, detail of departures and reasons therefore shall be submitted immediately for the Architect's consideration.

C. Do not allow installations to be concealed or enclosed before they have been inspected and tested. Should work be concealed before it has been inspected and tested, uncover at no additional cost, repairing as necessary after inspection.

D. Electrical License Requirements
   1. No Electrical Contractor shall perform electrical work on the contract without possessing a State of Arkansas Electrical Contractor License.
   2. All electricians shall have a copy of their license with them and shall be required to show it to an appropriate inspector upon request.

3.02 CERTIFICATION AND TESTS

A. Prior to request for final review test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.

C. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or his designated representative demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

3.03 PROJECT MODIFICATIONS

A. During the progress of construction, if such conditions arise that require revisions, modifications, or relocations to any electrical equipment or materials incorporated in this project, such alterations shall be immediately called to the attention of the Architect. Contractor shall then prepare necessary Drawings showing proposed changes. Submit proposed changes for review by the Architect prior to actual revision work in the field.

END OF SECTION 26 0200

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Nonmetallic-sheathed cable.

C. Metal-clad cable.

D. Wire and cable for 600 volts and less.

E. Wiring connectors.

F. Electrical tape.

G. Heat shrink tubing.

H. Wire pulling lubricant.

I. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 0536 - Cable Trays for Electrical Systems: Additional installation requirements for cables installed in cable tray systems.

D. Section 26 0200 - Electrical General Requirements

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.

B. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

F. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

G. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

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 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.

M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

Q. UL 719 - Nonmetallic-Sheathed Cables; Current Edition, Including All Revisions.

R. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide for each cable assembly type.

1.06 QUALITY ASSURANCE

A. Comply with 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.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 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. Concealed Dry Interior Locations: Use only building wire with Type THHN/THWN insulation in raceway.

D. Exposed Dry Interior Locations: Use only building wire with Type THHN/THWN insulation in raceway.

E. Above Accessible Ceilings: Use only building wire with Type THHN/THWN insulation in raceway.

F. Wet or Damp Interior Locations: Use only building wire with Type THHN/THWN insulation in raceway.

G. Exterior Locations: Use only building wire with Type THHN/THWN insulation in raceway.

H. Underground Installations: Use only building wire with Type XHHW insulation in raceway.

I. Use solid or stranded conductor for feeders and branch circuits 10 AWG and smaller.

J. Use stranded conductor for feeders and branch circuits 8 AWG and larger.

K. Use conductor not smaller than 12 AWG for power and lighting circuits.

L. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.

M. Conductor sizes are based on copper. Aluminum wire will not be accepted.

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. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.

H. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.

I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

J. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   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.

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.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.

4) Neutral/Grounded: White.

c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid or Stranded.
b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Installed Underground: Type XHHW-2.

2.04 NONMETALLIC-SHEATHED CABLE

A. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Uses Allowed: Nonmetallic-Sheathed Cable shall not be used on any portion of this project.

2.05 METAL-CLAD CABLE

A. 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.

B. Conductor Stranding:
1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

G. Uses Allowed: Metal Clad Cable shall only be allowed for final connections to equipment and grid mounted light fixtures where the cable is exposed or easily accessible.

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 0526.

2.07 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. 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. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

D. 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 raceway installation is complete and supported.

E. Verify that field measurements are as indicated.

F. 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. When circuit destination is indicated without specific routing, determine exact routing required.
2. Arrange circuiting to minimize splices.
3. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
4. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three 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.
   a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.
   b. Branch circuits fed from feed-through protection of GFI receptacles.
   c. Branch circuits with dimming controls.
   d. Branch circuits with isolated grounding conductor.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. 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.

F. 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.

G. Installation in Cable Tray: Also comply with Section 26 0536.

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. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   6. 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.
   2. Damp Locations: Use insulating covers specifically designed for the connectors.
      a. For connections with insulating covers, 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 0553.

T. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

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.

V. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

W. Clean conductor surfaces before installing lugs and connectors.

X. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

Y. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.

Z. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION 26 0519

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

E. Ground access wells.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 0536 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 0200 - Electrical General Requirements

E. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 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.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Field quality control test reports.

D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 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 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 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 first connected electrode.
6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

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. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
   b. 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. 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.
5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. 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 metal building frame.
8. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
9. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

I. Cable Tray Systems: Also comply with Section 26 0536.

J. Pole-Mounted Luminaires: Also comply with Section 26 5600.

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 0526:
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).

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 or compression connectors for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Holes for Connections: As indicated or as required for connections to be made.

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.

F. 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".

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 indicated.

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 accordance with NECA 1 (general workmanship).

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.
   2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.

D. 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.

E. Identify grounding and bonding system components in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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.

END OF SECTION 26 0526

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

B. Section 26 0536 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.

C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

E. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 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.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect/Engineer of conflicts with or deviations from 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 cured; see Section 03 3000.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

1.06 QUALITY ASSURANCE

1.07 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. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. 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.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   7. Steel Components: Use corrosion-resistant materials suitable for 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. Conduit and Cable Supports: Straps and clamps suitable for 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.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:
   1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
   2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
   1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
   2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for 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. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
   a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
   b. Comply with MFMA-4.
   c. Channel Material: Use galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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 hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect/Engineer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. 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. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

I. Cable Tray Support and Attachment: See Section 26 0536 for additional requirements.

J. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

K. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

L. Exterior Luminaire Support and Attachment: See Section 26 5600 for additional requirements.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 26 0529

SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Reinforced thermosetting resin conduit (RTRC).

1.02 RELATED REQUIREMENTS

A. Section 26 0200 - Electrical General Requirements

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.16 - Boxes for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 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 TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.

J. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 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.

S. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
   4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
   5. Notify Architect/Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.06 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).

3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
4. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or schedule 80 rigid PVC conduit where emerging from underground.
5. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows, PVC-coated galvanized steel rigid metal conduit (RMC) elbows, or concrete-encased PVC elbows for bends.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

J. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

K. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).

L. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).

M. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
1. Maximum Length: 6 feet.

N. Flexible Connections to Vibrating Equipment:
1. Dry Locations: Use flexible metal conduit (FMC).
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
3. Maximum Length: 6 feet unless otherwise indicated.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4-inch trade size.
2. Branch Circuit Homeruns: 3/4-inch trade size.
3. Control Circuits: 1/2-inch trade size.

4. Flexible Connections to Luminaires: 3/8-inch trade size.
5. Underground, Interior: 3/4-inch trade size.
6. Underground, Exterior: 1-inch trade size.

E. 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. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. 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.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.
a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. 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.

B. 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 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.10 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

E. Foam Conduit Sealant:
   1. Removable, two-part, closed-cell foam, specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
   3. Rated to hold minimum of 10 ft water head pressure.

F. Conduit Mechanical Seals:
   1. Listed as complying with UL 514B.
   2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
   3. Suitable for sealing around conductors/cables to be installed.

G. Sealing Systems for Concrete Penetrations:
   1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
   2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

H. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

I. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

J. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify routing and termination locations of conduit prior to rough-in.

E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit 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 without specific routing, determine exact routing required.
   3. Conceal 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.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route exposed conduits:
      a. Across floors.
      b. Across top of parapet walls.
      c. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route 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 equivalent of four 90-degree bends between pull points.
   9. Route conduits above water and drain piping where possible.
   10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
   12. 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.
   13. Group parallel conduits in same area on common rack.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
   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 trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
7. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
8. Use of wire for support of conduits is not permitted.

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. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide 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. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
6. 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.
7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

J. Underground Installation:
1. Provide trenching and backfilling in accordance with Sections 31 2316 and 31 2323.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 18 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Maximum Conduit Size: 1-inch trade size unless otherwise approved.
2. Install conduits within middle one third of slab thickness.
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 minimum concrete cover of 3 inches on all sides unless otherwise indicated; see Section 03 3000.

M. 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 calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
   4. Where conduits are subject to earth movement by settlement or frost.

N. Conduit Sealing:
   1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
      a. Where conduits enter building from outside.
      b. Where service conduits enter building from underground distribution system.
      c. Where conduits enter building from underground.
      d. Where conduits may transport moisture to contact live parts.
   2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
      a. Where conduits pass from outdoors into conditioned interior spaces.
      b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

O. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

P. Provide grounding and bonding; see Section 26 0526.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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. 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.

3.06 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

B. Route conduit through roof openings for piping and ductwork wherever possible. Where separate roofing penetration is required, coordinate location and installation method with roofing contractor.

END OF SECTION 26 0533.13

SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 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.

1.02 RELATED REQUIREMENTS

A. Section 26 0200 - Electrical General Requirements

B. Section 07 8456 - Fire Safing.

C. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Additional requirements for locating boxes for wiring devices.

G. Section 27 1000 - Structured Cabling for Voice and Data: Additional requirements for communications systems outlet boxes.

1.03 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 FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 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 suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.
   7. Do not use "through-wall" boxes designed for access from both sides of wall.

8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. 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.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 2726.

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. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
b. Back Panels: Painted steel, removable.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

C. Verify that conditions are satisfactory for installation prior to starting work.

D. Verify locations of floor boxes and outlets in offices and work areas prior to rough-in.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) 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. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 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 2726.
b. Communications Systems Outlets: Comply with Section 27 1000.

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 0533.13.
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.

I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 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.

J. Install boxes plumb and level.

K. 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.

L. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

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 8400.

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 0526.

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 26 0533.16

SECTION 26 0548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements for seismic protection measures to be applied to electrical equipment and systems specified herein are in addition to any other items called for in other sections of these specifications. Electrical equipment shall include the following items to the extent required on plans or in other sections of these specifications:
   1. Light fixtures.
   2. Switchboards (floor mounted).
   3. Switch gear.
   4. Conduits.
   5. Cable Tray Systems.

1.02 INSTALLATIONS NOT REQUIRING SPECIAL SEISMIC RESTRAINTS

A. Seismic restraints may be omitted from the following installations.
   1. All electrical conduit less than 2-1/2” inside diameter.
   2. All conduit suspended by individual hangers 12” or less in length from the top of support rod to the bottom of the support for the hanger.

1.03 SHOP DRAWINGS

A. Shop drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed below shall be submitted. Submittals shall be complete in detail; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

PART 2 PRODUCTS

2.01 BOLTS AND NUTS

A. SQUAREHEAD BOLTS AND HEAVY HEXAGON NUTS: ANSI B1 8.2.1 and B1 8.2.2, and ASTM A307 or A576.

B. BOLTS, UNDERGROUND: ASTM A325.

2.02 SWAY BRACE

A. Materials used for seismic members shall be structural steel conforming with ASTM A36.

B. Any other sway bracing system products and materials shall be listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown

PART 3 EXECUTION

3.01 SWAY BRACE

A. Sway brace shall be installed on conduit and cable tray not otherwise rigidly anchored to preclude damage during seismic activity. Bracing shall conform to approved arrangements. Hanger rods shall be increased in cross sectional area proportionate to the increased weight per linear foot of conduit, cable tray and contents supported at each trapeze hanger. No trapeze-type hanger shall be secured with less than two ½” bolts.

B. TRANSVERSE SWAY BRACING: Transverse sway bracing shall be provided at intervals not to exceed 30'-0”.

C. LONGITUDINAL SWAY BRACING: Longitudinal sway bracing shall be provided at 40'-0” intervals.

D. VERTICAL RUNS: Vertical runs of conduit and cable tray shall be braced at not more than 10'-0” vertical intervals.

E. ANCHOR RODS, ANGLES, AND BARS: Anchor rods, angles, and bars shall be bolted to conduit clamps at one end and cast-in-place concrete or masonry insert or clip angles bolted to the steel structure on the other end. Rods shall be solid metal or pipe as specified hereinafter.

F. BOLTS: Bolts used for attachment of anchors to pipe and structure shall be not less than ½" diameter.

3.02 SPREADERS

A. Spreaders shall be provided between racked or adjacent conduit runs to prevent contact during seismic activity whenever surfaces are less than 4" apart or four times the maximum displacement due to seismic force. Spreaders to be applied at same interval as sway braces.

3.03 ANCHOR BOLTS

A. All floor or pad mounted equipment will have a minimum of four anchor bolts securely fastened through base. Two nuts shall be provided on each bolt. Anchor bolts shall have an embedded straight length equal to at least 10 times the nominal diameter of the bolt and shall be sized in accordance with ASTM A325 and A576.

B. When height-to-width ratio of the equipment exceeds 8.9, overturning must be investigated.

3.04 EQUIPMENT SWAY BRACING

A. Equipment sway bracing shall be provided for all items supported from overhead floor or roof structures. Braces shall consist of angles, rods, bars, or pipes run at a 45° angle from the equipment frame to the building structure secured at both ends with not less than ½" bolts. Bracing shall be provided in two planes of directions, 90° apart, for each item of equipment. Sufficient braces shall be provided for equipment to resist a horizontal force equal to 113% of the weight of equipment without exceeding safe working stress of bracing components. Details of all equipment bracing shall be submitted for approval. In lieu of bracing with vertical supports, these items may be supported with hangers inclined at 45°, provided that supporting members are properly sized to support operating weight of equipment when inclined at a 45°angle.

3.05 LIGHTING FIXTURES IN BUILDINGS

A. In addition to the requirements of the preceding paragraphs, lighting fixtures and supports will conform to the following:

B. MATERIALS AND CONSTRUCTION:

1. Fixture supports shall be malleable iron.
2. Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.
3. Recessed fluorescent fixtures shall be supported by a seismic resistant suspended ceiling support system and shall be attached thereto at each corner of the fixture with earthquake clips; AND shall be provided with fixture support wires attached to the building structural members using one wire at each end of fixture.
4. A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 4" boxes, 3" plaster rings, and fixture studs.
5. Surface mounted fluorescent individual or continuous row fixtures shall be attached to a seismic resistant ceiling support system. Fixture support devices for attaching to suspended ceilings shall be a locking-type scissor clamp or a full loop band that will securely attach to the ceiling support. Fixtures attached to underside of a structural slab shall be properly anchored to the slab at each corner of the fixture.

6. Each wall mounted emergency light unit shall be secured in a manner to hold the unit in place during a seismic disturbance.

END OF SECTION 26 0548

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Voltage markers.

D. Underground warning tape.

E. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 26 0200 - Electrical General Requirements

B. Section 26 0536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

C. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

D. Section 27 1000 - Structured Cabling for Voice and Data: Identification for communications cabling and devices.

1.03 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. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 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.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 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) Use identification nameplate to identify main overcurrent protective device.
4) 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 main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Transformers:
1) Identify kVA rating.
2) Identify voltage and phase for primary and secondary.
3) Identify load(s) served. Include location when not within sight of equipment.

d. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
2) Identify load(s) served. Include location when not within sight of equipment.

e. Time Switches:
1) Identify load(s) served and associated circuits controlled. Include location.

f. Enclosed Contactors:
1) Identify load(s) and associated circuits controlled. Include location.

g. Transfer Switches:
1) Identify voltage and phase.
2) Identify load(s) served. Include location when not within sight of equipment.
3) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

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. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.

5. 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.

6. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

7. 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.
b. Industrial control panels.
c. Motor control centers.
d. Elevator control panels.
e. Industrial machinery.

8. 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.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
   2. Identification for Communications Conductors and Cables: Comply with Section 27 1000.
   3. 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 when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Cable Tray: Comply with Section 26 0536.

D. Identification for Boxes:
   1. Use voltage markers to identify highest voltage present.
   2. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

E. Identification for Devices:
   1. Identification for Communications Devices: Comply with Section 27 1000.
   2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.

F. Buried Electrical Lines: Underground warning tapes.

G. Communication Cabinets: Nameplates.

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. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
      a. Use only for indoor locations.
   2. 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) Emergency Power System: Identify with text "EMERGENCY".

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: 1/2 inch.
   b. Equipment Designation: 1/4 inch.
   c. Other Information: 1/8 inch.
5. Color:
   a. Normal Power System: White text on black background.
   b. Emergency Power System: White text on red background.

D. 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.

2.03 VOLTAGE MARKERS

A. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

B. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

C. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
   a. Emergency Power System: Text "EMERGENCY".

D. Color: Black text on orange background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE

A. 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.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

D. Legend: Type of service, continuously repeated over full length of tape.

E. 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.

2.05 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. 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.

C. 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.
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.
1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

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 4000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION 26 0553

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. Outdoor photo controls.

D. Lighting contactors.

1.02 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

E. Section 26 5100 - Interior Lighting.

F. Section 26 5600 - Exterior Lighting.

1.03 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. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2000 (R2005), with errata, 2008.

F. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (R2011).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.

I. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

J. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

K. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.

L. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 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 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.

1.05 SUBMITTALS

A. See Section 01 3000 - 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. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 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.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - 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. 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. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic 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, up to a maximum time delay setting of not less than 5 minutes and not more than 30 minutes.
8. Sensitivity: Field adjustable.
9. 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.

B. 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 drawings, provide line voltage units with self-contained relay.
      c. 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.
      d. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
   2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
   3. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

C. 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 drawings, provide low voltage units, for use with separate compatible accessory power packs.
      c. 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. 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.

D. 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 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.
   b. Long Range Sensors: Capable of detecting motion within a distance of 80 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.

E. 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 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.
   c. Motor Load: Not less than 1 HP.

F. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated.

2.03 TIME SWITCHES

A. 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. 7-Day 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.
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.
8. Input Supply Voltage: As indicated on the drawings.
9. Output Switch Configuration: As required to control the load indicated on drawings.
10. Output Switch Contact Ratings: As required to control the load indicated on drawings.
11. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
    a. Indoor clean, dry locations: Type 1.
    b. Outdoor locations: Type 3R.
12. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

B. Electromechanical Time Switches:
1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
2. Program Capability:

a. 7-Day Time Switches: Capable of different schedule for each day of the week.
3. Schedule Capacity:
a. 7-Day Time Switches: Accommodating not less than two pairs of selected on/off operations per day.
4. Provide spring reserve backup to maintain clock during power outage.
5. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
6. Input Supply Voltage: As indicated on the drawings.
7. Output Switch Configuration: As required to control the load indicated on drawings.
8. Output Switch Contact Ratings: As required to control the load indicated on drawings.
9. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:
a. Indoor clean, dry locations: Type 1.
b. Outdoor locations: Type 3R.
10. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

2.04 OUTDOOR PHOTO CONTROLS

A. 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.

2.05 LIGHTING CONTACTORS

A. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on the drawings.

B. Short Circuit Current Rating:
1. Provide contactors with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

C. Enclosures:
1. Comply with NEMA ICS 6.
2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
a. Indoor Clean, Dry Locations: Type 1 or Type 12.
b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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. Install lighting control devices in accordance with NECA 1 (general workmanship) 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 0533.16 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.

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 2726.

G. Provide required supports in accordance with Section 26 0529.

H. 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.

I. Identify lighting control devices in accordance with Section 26 0553.

J. 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.

K. 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.

L. 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.

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 4000 - 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.

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 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of lighting control devices to Architect/Engineer, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner'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. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
   3. Location: At project site.

END OF SECTION 26 0923

SECTION 26 2100

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical service requirements.

1.02 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.13 - Conduit for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 26 2416 - Panelboards: Service entrance equipment.

G. Section 26 2816.16 - Enclosed Switches: Service entrance equipment.

H. Section 31 2316 - Excavation.

1.03 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

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. Notify Architect/Engineer of any conflicts with or deviations from 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. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.06 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.

1.07 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:
   1. Service Type: Underground.
   2. Service Voltage: 208Y/120 V, 3 phase, 60 Hz.

C. Utility Company: Entergy Arkansas.
   1. Point of Contact: Adam Boyles.

D. Division of Responsibility:
   1. Pole-Mounted Utility Transformers:
      a. Utility Poles: Furnished and installed by Utility Company.
      b. Transformers: Furnished and installed by Utility Company.
      c. Transformer Grounding Provisions: Furnished and installed by Utility Company.
      d. Primary: Furnished and installed by Utility Company.
      e. Secondary - Underground Service:
         1) Conduits: Furnished and installed by Contractor.
         2) Conductors: Furnished and installed by Utility Company (Service Point at service entrance equipment).
   2. Terminations at Service Point: Provided by Utility Company.
   3. Metering Provisions:
      a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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 accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 3000.

F. Provide required protective bollards in accordance with Utility Company requirements.

G. Provide required support and attachment components in accordance with Section 26 0529.

H. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.

I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

3.04 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION 26 2100

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0200 - Electrical General Requirments.

D. Section 26 0529 - Hangers and Supports for Electrical Systems.

E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 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 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

O. UL 1699 - Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

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. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

D. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

1.08 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. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Engineer Approved Equal.

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 as indicated on the drawings.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. 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 solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. 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 where indicated, 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.
      c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

K. 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.

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.
   2. Provide thermal magnetic circuit breakers.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.

F. Minimum integrated short circuit rating:
   1. 240 Volt Panelboards: 22,000 amperes rms symmetrical.
   2. 480 Volt Panelboards: 30,000 amperes rms symmetrical.

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.

F. Minimum Integrated Short Circuit Rating:
   1. 240 Volt Panelboards: 10,000 amperes rms symmetrical.
   2. 480 Volt Panelboards: 14,000 amperes rms symmetrical.

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.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating 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.
   a. Provide interchangeable trip units where indicated.
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. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
7. Do not use tandem circuit breakers.
8. Do not use handle ties in lieu of multi-pole circuit breakers.
9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
10. 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.

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 indicated.

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. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 0529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. 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.

I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.

J. 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.

K. Provide grounding and bonding in accordance with Section 26 0526.
   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.

L. Install all field-installed branch devices, components, and accessories.

M. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

N. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.

O. Provide filler plates to cover unused spaces in panelboards.

P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
   1. Emergency and night lighting circuits.
   2. Fire detection and alarm circuits.

Q. Identify panelboards in accordance with Section 26 0553.

R. Provide computer-generated circuit directory for each lighting and appliance panelboard and each power distribution panelboard provided with a door, clearly and specifically indicating the loads served. Identify spares and spaces.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

E. Test GFCI circuit breakers to verify proper operation.

F. Test AFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. 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 26 2416

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

D. Floor box service fittings.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0200 - Electrical General Requirements.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors.

1.03 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.

1.04 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 installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Notify Architect/Engineer of any conflicts or deviations from 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.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 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 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.

H. For flush floor service fittings, use tile rings for installations in tile floors.

I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Light Almond with Light Almond nylon wall plate.

C. Wiring Devices Installed in Finished Spaces: Light Almond with Light Almond nylon wall plate.

D. Wiring Devices Installed in Unfinished Spaces: Gray with stainless steel wall plate.

E. Wiring Devices Installed in Wet or Damp Locations: Gray with specified weatherproof cover.

2.03 WALL SWITCHES

A. 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.

B. 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.

2.04 RECEPTACLES

A. 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.

B. 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 SD 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.

C. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and 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 SD 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.

2.05 WALL PLATES

A. 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.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet 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.

2.06 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.

B. Flush Floor Service Fittings:
   1. Single Service Flush Convenience Receptacles:
      a. Cover: Rectangular.
      b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
   2. Dual Service Flush Combination Outlets:
      a. Cover: Rectangular.
      b. Configuration:
         1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2) Communications: _____.
3) Voice and Data Jacks: Provided by others.

3. 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 indicated.

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 accordance with NECA 1 (general workmanship) 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 0533.16 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.
      d. All mounting heights specified in the project documents are to the center of the device box, unless otherwise noted..
   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 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 vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.

L. 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.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch and fan speed controller 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.

B. Adjust presets for wall dimmers according to manufacturer's instructions 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.

END OF SECTION 26 2726

SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 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.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

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. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 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.

1.08 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. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Engineer Approved Equal.

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 acceptable, except where not permitted by motor contribution according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

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.

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.
3. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

C. Conductor Terminations:
1. Provide mechanical lugs unless otherwise indicated.
2. 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 interchangeable trip units 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 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 indicated.

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 products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

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 0526.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Identify enclosed circuit breakers in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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. Test shunt trips to verify proper operation.

E. 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 26 2816.13

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 0200 - Electrical General Requirements.

1.03 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.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 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 Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 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.

1.08 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. ABB/GE: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com.

C. Schneider Electric; Square D Products: www.schneider-electric.us.

D. Siemens Industry, Inc: www.usa.siemens.com.

E. Engineer Approved Equal.

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.
   2. Minimum Ratings:
      a. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
      b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. 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.
      c. Interior Damp Locations: Type 4X.
   2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. 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.

P. 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.
   2. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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 products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

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 0526.

H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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 26 2816.16

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0200 - Electrical General Requirements.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.

E. Section 26 5600 - Exterior Lighting.

1.03 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/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial 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. NFPA 101 - Life Safety Code; 2015.

J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

K. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

L. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.

M. UL 1598 - Luminaires; Current Edition, Including All Revisions.

N. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 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 Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - 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.

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.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and NFPA 101.

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.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting) and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

C. Provide 2-year manufacturer warranty for linear fluorescent ballasts.

D. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

E. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

F. Provide 3-year full warranty for fluorescent emergency power supply units.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in Lighting Fixture Schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that are listed and labeled as complying with UL 1598, where applicable.

B. Provide products that comply with requirements of NFPA 70 and NFPA 101.

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, 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. 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.

H. 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.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 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. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

G. 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.

2.04 EXIT SIGNS

A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.

B. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

C. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Self-Powered Exit Signs:
      a. 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.
      b. Battery: Sealed, maintenance-free, nickel cadmium unless otherwise indicated.
      c. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
      d. Provide low-voltage disconnect to prevent battery damage from deep discharge.

D. Accessories:
   1. Provide compatible accessory wire guards where indicated.

2.05 BALLASTS AND DRIVERS

A. 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.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

B. 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.

2.06 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. 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 gauge, 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.

G. 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.

H. 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.
   4. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.

L. 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.

M. 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.

N. 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.

O. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test emergency lighting units to verify proper operation upon loss of normal power supply.

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. 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.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting) and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect/Engineer, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.09 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 5100

SECTION 26 5600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0200 - Electrical General Requirements.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0533.16 - Boxes for Electrical Systems.

E. Section 26 0923 - Lighting Control Devices.
   1. Includes automatic controls for lighting including time switches and outdoor photo controls.
   2. Includes lighting contactors.

F. Section 26 5100 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals; American Association of State Highway and Transportation Officials; 6th Edition, with 2015 Interim Revisions.

B. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.

C. IEEE C2 - National Electrical Safety Code; 2012.

D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

G. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
   2. Notify Architect/Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 01 3000 - 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 structural calculations for each pole proposed for substitution.

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.
   2. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

1.06 QUALITY ASSURANCE

A. Comply with 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. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.07 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.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in Lighting Fixture Schedule included on the Drawings.

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 AND DRIVERS

A. 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.

B. 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.

2.04 POLES

A. All Poles:
1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Structural Design Criteria:
a. Comply with AASHTO LTS.
b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
3. Material: Steel, unless otherwise indicated.
4. Shape: Square straight, unless otherwise indicated.
5. Finish: Match luminaire finish, unless otherwise indicated.
6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
7. Unless otherwise indicated, provide with the following features/accessories:
a. Top cap.
b. Handhole.
c. Anchor bolts with leveling nuts or leveling shims.
d. Anchor base cover.

B. Metal Poles: Provide ground lug, accessible from handhole.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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 0533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

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.

G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

H. Pole-Mounted Luminaires:
   1. Maintain the following minimum clearances:
      a. Comply with IEEE C2.
      b. Comply with utility company requirements.
   2. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
      e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
      f. Install anchor base covers as indicated.
   3. Embedded Poles: Install poles plumb as indicated.
   4. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   5. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

I. Install accessories furnished with each luminaire.

J. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect/Engineer.

E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

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.

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.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect/Engineer, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

3.09 SCHEDULE - SEE DRAWINGS

END OF SECTION 26 5600

SECTION 27 4100
SOUND SYSTEM

PART 1 - GENERAL

1.01 CODES, REGULATION, AND STANDARDS

A. Pertinent federal, state, and local regulations and requirements are hereby made a part of this contract. Requirement of authority having local jurisdiction shall supersede all other requirements.

B. All local and national codes and all requirements of the National Board of Fire Underwriters are a part of this specification and shall be observed as such. The installation shall comply with all requirements and regulations applicable to the work. If the plans and specifications are at variance therewith, the work shall be installed in accordance with the local laws, rules, regulations and ordinances, provided the standard of work required by ordinance is not less than the requirements of this specification.

C. If the Contractor shall do work contrary to such laws, ordinances, etc., he shall bear all costs arising therefrom. No additional compensation will be allowed for full compliance with local or national laws, codes, or ordinances.

1.02 PERMITS, LICENSES, INSPECTIONS, AND TAXES

A. The Contractor shall obtain and pay for all permits and licenses, and shall give notice, pay all taxes, and comply with all laws, rules, and regulations bearing on the work.

B. The Contractor shall make arrangements for any necessary permits and inspections.

1.03 CONTRACTOR QUALIFICATIONS

A. To provide single unit responsibility for the delivery, successful installation, and service during the warranty period for the Sound System, the sound system specified herein shall be provided under the Electrical Contractor's contract.

B. An Electrical Contractor who does not meet all requirements of the Sound System Supplier (hereinafter referred to as SSS) listed in the following paragraphs 1.3-C through 1.3-H, who intends to bid on this work will be required to employ the services of a qualified Sound System Sub-Contractor to provide, install, and terminate all sound system equipment. The Sound System Sub-Contractor must be named in the shop drawing submittal information along with written documentation verifying that the Sound System Sub-Contractor fulfills all requirements listed in paragraphs 1.3-C through 1.3-F below, including proof of dealership status for all listed system components or approved alternates.

C. The Sound System Supplier (SSS) must be a contractor who has regularly furnished and installed commercial and industrial sound systems of the type specified for a minimum of the last 5 years.

D. The SSS must maintain a suitably staffed and equipped service organization and must regularly offer maintenance services for systems of this type and size.

E. The SSS must be an authorized dealer of all equipment provided with this system. Given the inherent warranty difficulties which occur when products are provided from contractors who participate in trans-shipping or two-stepped equipment sales.

F. The SSS shall be the manufacturer's authorized field assembly and warranty service representative, shall be trained and approved by the manufacturer to program the manufacturer's products and inspect the installation of the manufacturer's products, and shall be located within 100 miles driving distance of the project site.

G. The qualified SSS (the Sound System Subcontractor if the Electrical Contractor does not fulfill all requirements listed in paragraphs 1.3-C through 1.3-F above) must perform all of the work listed below:

1. Prepare required drawings for submittal.

2. Furnish all sound system equipment.
3. Provide shop fabrication of all equipment cabinets, outlet plates and panels, and subassemblies.
4. Perform all final terminations at the audio equipment cabinets, mixing consoles, program sources, signal processors, and all other sound system devices.
5. Provide the final terminations at all input and output connection panels.

H. The Electrical Contractor shall provide and install all specified sound system wire.

1.04 SPECIFICATIONS AND DRAWINGS

A. These specifications and drawings are mutually self-explanatory and anything described or shown on one but not the other shall be considered as if shown on both. Should error or discrepancy appear on either the drawings or in the specifications, such error shall be referred to the engineer before bids are submitted.

B. Drawings must be considered as being diagrammatic; no attempt has been made to show each and every conduit, pull box, etc.

C. It is the intention of these specifications and drawings to provide a working installation in every detail and all items required for such installation shall be furnished whether or not specifically shown or enumerated. The work shall be done in keeping with the general intent to provide a complete installation.

1.05 "AS BUILT" OR RECORD DRAWINGS

A. The Contractor shall keep a record of all changes in final location of conduit, etc., and as actually installed, and upon completion of the job he shall transmit these changes to the engineer for inclusion in the record set of drawings.

1.06 SUBSTITUTIONS

A. All substitutions shall be approved by the engineer at least 10 days prior to the date bids are due. Any item submitted for substitution is subject to rejection if said equipment is not of equal quality, function, capacity, or of like design, appearance, and performance.

1.07 TEST

A. The Contractor shall test the system and equipment after his work is complete in the presence of the engineer to demonstrate that the system has been installed properly and is in working order. Failure to perform adequate tests for such proof may delay final acceptance of job.

1.08 WORK INCLUDES

A. General
1. Contractor shall provide all equipment, accessories, and materials, in accordance with these specifications and drawings, to provide a complete and operating system.
2. Furnish and install all component parts of the system as specified and indicated, including accessories, parts, appliances, etc., necessary or customary for their proper operation whether specifically called for or not. All materials shall be new and shall conform to the standards of the Underwriters Laboratories, Inc., where such a standard has been established for the particular type specified.
3. Contractor shall furnish all tools, scaffolding, lifts, and other necessary mechanical equipment required for the complete installation of this system.
4. Contractor shall install power circuit wiring, circuit breakers, power outlets, ground wire, and associated conduit to provide all necessary power to the sound system.
5. The sound system shall be of modular design to facilitate both expansion and service and shall be completely transistorized/solid-state.
6. All microphone cable, speaker cable, and antenna cable shall be installed in appropriate conduit or raceway.
7. Microphone cable shall be run in separate conduit from the speaker cable.
8. The Contractor shall:

a. furnish and install all required conduit, outlet and junction boxes, terminal cabinets, etc.
b. furnish, install, and properly tag all speaker cables as to circuit designation.
c. design equipment supports with a safety factor of at least five (5) for overhead loudspeakers or other suspended equipment.
d. provide all speaker mounting hardware as required to securely fasten speakers.

1.09 QUALITY ASSURANCE

A. The equipment furnished shall meet the requirements of these specifications and drawings and shall be the standard product line of the manufacturers.

B. The system supplier shall be the authorized distributor of the equipment supplied and shall be authorized and equipped to service the equipment supplied in and out of warranty, fully empowered to support the manufacturer's warranty program.

C. The work herein specified shall be performed by fully competent workmen, in a thorough manner. All necessary hookup and installation shall be by qualified personnel. All materials furnished by the contractor shall be new, and all work shall be completed to the satisfaction of the engineer.

1.10 IN-SERVICE TRAINING

A. The installation supervisor shall instruct the personnel designated by the owner as to the correct operation of the system. A minimum of two (2) hours shall be included in the base bid for this purpose.

1.11 SUBMITTALS

A. At the time of submittal, the contractor shall submit a complete and accurate listing of all major items of equipment to be used in assembling the system, including all items of equipment listed under this specification, including quantity, make, model, and description; as well as contractor's block diagrams indicating the proposed interconnection of all equipment to be furnished. A detailed listing of all proposed deviations from the specifications shall be included. All modifications to standard equipment necessary to meet specifications shall be explained fully and must be accompanied by schematic diagrams. Submit complete manufacturer specification sheets for all major items of equipment to be used in assembling the system.

1.12 OPERATION AND MAINTENANCE DATA

A. The system supplier shall provide one (1) complete set of shop drawings and as-built drawings including all wiring diagrams; complete instruction manuals, schematic drawings, and service instructions.

B. The equipment manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

C. The equipment supplier shall be qualified to furnish, and capable of providing to the owner, a service contract proposal covering all labor and materials to maintain the system for a period of time agreed upon by the owner and system supplier after the initial warranty period.

D. The equipment supplier shall warranty all equipment, material, and installation for a period of one (1) year from the date of completion for first beneficial use, whichever occurs first. All repairs/replacements shall be provided at no charge to the owner during the warranty period provided the failed unit does not show abuse.

PART 2 - BILL OF MATERIAL

2.01 COURT ROOM AV SYSTEM

A. One (1) main equipment cabinet located in the court room as shown on the project drawings that contains one (1) Allen & Heath QU-PAC-32 digital mixer, power sequencer, wireless assistive listening transmitter w/four (4) ALS receivers, two (2) wireless microphone receivers,

and one (1) power amplifier. Note that the digital mixer will be connected to a wireless access point for control via an iPad.

B. System shall include the following components:
   1. One (1) stand mounted cardioid condenser gooseneck podium microphone.
   2. Eight (8) table mounted cardioid condenser gooseneck microphones at courtroom table.
   3. One (1) wireless handheld microphone transmitter.
   4. Three (3) HDMI input & 3.5mm auxiliary audio input plates.
   5. Two (2) Bluetooth audio input plate.
   6. Four (4) 1 gang microphone input plate with two (2) microphone inputs.
   7. Six (6) ceiling mounted, 6.5", 2-way Electrovoice loudspeakers.
   8. Two (2) 10" ceiling mounted Electrovoice subwoofer loudspeakers.
   9. One (1) wall mounted television and video decoder. Verify TV equipment with Owner.
   10. One (1) wall mounted control panel near equipment cabinet and one(1) wireless remote touchscreen control panel at the courtroom table to control audio and video input source selection, digital mixer system settings, and system volume control.

C. System can be powered On/Off from the Sound Equipment Cabinet at location indicated on project drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Power Requirements:
   1. Electrical Contractor shall provide and terminate 120VAC circuits to the sound equipment cabinet (SEC) as required.
   2. The electrical contractor shall provide and install one (1) #6 insulated ground wire from the sound equipment cabinet (SEC) to the local AC breaker panel ground that is supplying power to the sound system.

B. All cables shall be properly dressed and tagged in the equipment rack and at all junction points.

C. Install all fixtures, assemblies, and equipment as specified herein and as indicated on the drawings in strict accordance with the manufacturer's recommendations and instructions.

D. All equipment, except portable equipment, shall be held firmly in place. This shall include loudspeakers, amplifiers, cables, etc. (The exception to this rigid mounting clause is when it is required to use resilient shock mounting to decouple the speakers from the structure to which they are being mounted.) All speakers shall be attached to supporting structure via appropriate hardware and clamps. Fastenings and supports shall be adequate to support their loads with a safety factor of at least five (5).

E. Care shall be exercised in wiring so as to avoid damage to the cables and to the equipment. All joints and connections shall be made with rosin-core solder or with mechanical connectors approved by the engineer. All wiring shall be executed in strict adherence to standard broadcast practices.

F. When complete, all wiring shall test free from opens, shorts, and grounds. All microphone wire runs shall be made using one continuous wire run without splices.

G. The total impedance of all loudspeaker lines shall be measured and recorded. All cables shall be identified and properly tagged.

H. Precautions shall be taken as are necessary to guard against electromagnetic and electrostatic hum, to supply adequate ventilation, and to install the equipment so as to provide maximum safety to the person who operates it.

I. All microphone jacks, outlets, switches, and associated controls are to be permanently and logically marked with white on black labels.

J. Sound contractor shall make final adjustments of all devices to obtain a fully functional system.

K. Equalization shall be performed by qualified personnel using pink noise, a calibrated microphone, a real-time audio spectrum analyzer, and a computer to adjust the acoustic amplitude response of the sound system to within + 2 dB uniformity from 250 Hz to 15 kHz and to conform to predetermined house curves acceptable to professional audio standards.

3.02 DEMONSTRATION

A. Prior to acceptance, equipment supplier shall demonstrate the functionality of the system to the engineer.

B. Provide one (1) copy of operation and maintenance data to the owner.

C. Provide a minimum of two (2) hours training to the owner's personnel in the proper set up and operation of the Sound System.

END OF SECTION 27 4100

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Maintenance of fire alarm system under contract for specified warranty period.

1.02 RELATED REQUIREMENTS

A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

B. Section 26 0548 - Vibration and Seismic Controls for Electrical Systems: Requirements for the seismic qualification of equipment specified in this section.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).

C. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; 2016.

F. NFPA 101 - Life Safety Code; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Evidence of installer qualifications.

C. Evidence of maintenance contractor qualifications, if different from installer.

D. 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.

E. Operating and Maintenance Data: See Section 01 7800 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.

F. Project Record Documents: See Section 01 7800 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.

G. Closeout Documents:
   1. Certification by manufacturer that the system has been installed in compliance with manufacturer's 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.
   3. Maintenance contract.

1.05 QUALITY ASSURANCE

A. 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 .

B. 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.
   3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
   4. Contract maintenance office located within 150 miles of project site.
   5. Certified in the State in which the Project is located as fire alarm installer.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 WARRANTY

A. 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.

B. 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/Notifier ; Notifier Fire Warden NFW-50: www.notifier.com.

B. Fire Alarm Control Units and Accessories - Other Acceptable Manufacturers:
   1. Honeywell Security & Fire Solutions/Gamewell-FCI: www.gamewell-fci.com/#sle.
   2. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com/#sle.
   3. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com/#sle.
   4. Siemens Building Technologies, Inc/Faraday: www.us.sbt.siemens.com/faraday.
   5. Simplex, a brand of Johnson Controls: www.simplex-fire.com/#sle.
   6. Engineer Approved Equal.

C. Initiating Devices and Notification Appliances:
   1. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

D. Substitutions: See Section 01 6000 - 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 Contract Documents or not.
   2. Protected Premises: Entire building shown on drawings.
   3. 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. 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.
   4. Evacuation Alarm: Single smoke zone; general evacuation of entire premises.
   5. Hearing Impaired Occupants: Provide visible notification devices in all public areas.
   6. Master Control Unit (Panel): New, at location indicated on drawings.
   7. Combined Systems: Do not combine fire alarm system with other non-fire systems.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By remote 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.

C. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style B.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
   3. Notification Appliance Circuits (NAC): Class B, Style Y.

D. Spare Capacity:
   1. Initiating Device Circuits: Minimum 25 percent spare capacity.
   2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
   3. Fire Alarm Control Units: 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.

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
   1. Sprinkler water flow.

2.04 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted units are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: 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. Addressable Modules:
   1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
   2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
   3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.
   4. Control Modules: Provide as indicated or as required for selective control of notification appliances.
   5. Relay Modules: Provide as indicated or as required to perform necessary functions via dry-contact interface. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.

E. Remote Annunciators: Notifier #LCD-2X20.

F. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
   2. Dual-Action Manual Pull Stations: Notifier #NBG-12LX.
   3. Smoke Detectors: Notifier #FSP-851.
   4. Duct Smoke Detectors: Notifier #FSD-751PL
   5. Heat Detectors: Notifier #FST-851
   6. Addressable Monitor Modules: Notifier #FZM-1.
   7. Addressable Control Modules: Notifier #FCM-1.
   8. Addressable Relay Modules: Notifier #FRM-1.

G. Notification Appliances:
   1. Bells: Notifier #SSM24-8 w/ weatherproof backbox #WBB.
   2. Horn/Strobes: Notifier SpectrAlert Series #P1224MC.
   3. Strobes: Notifier SpectrAlert Series #S1224MC.

H. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

I. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

J. 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

K. 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.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 3 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

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. All aspects of operation have been demonstrated to Owner.
   3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   4. Specified pre-closeout instruction is complete.

3.05 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

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 28 4600