Specifications

LAW ENFORCEMENT TRAINING ACADEMY BARRACKS

BLACK RIVER TECHNICAL COLLEGE

Pocahontas, Arkansas

Commission No. 2405

BRACKETT KRENNERICH

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SECTION 00 0101
PROJECT TITLE

LAW ENFORCEMENT TRAINING ACADEMY BARRACKS
BLACK RIVER TECHNICAL COLLEGE
POCAHONTAS, ARKANSAS

OWNER:
BLACK RIVER TECHNICAL COLLEGE
1410 HIGHWAY 304E
POCAHONTAS, AR 72455

OWNER'S REPRESENTATIVE:
DR. EGGENSPERGER, PRESIDENT
(870) 248-4000

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

CONSULTING ENGINEERS:

CIVIL ENGINEER
DECLERK-THROESCH ENGINEERING
PO BOX 804
POCAHONTAS, AR 72455
(870) 892-5975

STRUCTURAL ENGINEER
FOWLER ENGINEERING, LLC/RAINWATER ENGINEERING
1989 OAK TREE COVE, SUITE A
HERNANDO, MS 38632
(662) 469-9571

MECHANICAL/PLUMBING/ELECTRICAL ENGINEER
TRU ENGINEERING
254 W. MULBERRY ST., SUITE 2
SEARCY, AR 72143

COMMISSION NUMBER: 2405

PROJECT DOCUMENTS DATE: AUGUST 23, 2024

DIVISION 00

PROCUREMENT
AND CONTRACTING REQUIREMENTS

00 0110

TABLE OF CONTENTS

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 0101	PROJECT TITLE	1
00 0110	TABLE OF CONTENTS	4
00 0115	LIST OF DRAWINGS SHEETS	2
00 1113	ADVERTISEMENT FOR BIDS	1
00 2100	INSTRUCTIONS TO BIDDERS	7
00 3100	AVAILABLE PROJECT INFORMATION	44
00 4100	BID FORM	3
00 5200	AGREEMENT FORM	9
00 6000	PROJECT FORMS	11
00 7200	GENERAL CONDITIONS	41
00 7300	SUPPLEMENTARY CONDITIONS	6

DIVISION 01 – GENERAL REQUIREMENTS

01 1100	SUMMARY OF THE WORK	2
01 1115	ITEMS FURNISHED BY OWNER	1
01 2100	ALLOWANCES	1
01 2200	UNIT PRICES	2
01 2300	DEDUCTIVE ALTERNATES	1
01 2973	SCHEDULE OF VALUES	2
01 2976	PROGRESS PAYMENT PROCEDURES	1
01 3113	COORDINATION	1
01 3119	PROJECT MEETINGS	2
01 3216	CONSTRUCTION SCHEDULES	1
01 3223	SURVEY AND LAYOUT DATA	1
01 3323	SUBMITTALS	4
01 4000	QUALITY REQUIREMENTS	4
01 4329	SPECIAL INSPECTIONS	1
01 5000	TEMPORARY FACILITIES AND CONTROLS	1
01 5710	EXCAVATION SAFETY PROCEDURES	1
01 5713	TEMPORARY EROSION AND SEDIMENT CONTROL	3
01 5719	ENVIRONMENT PROTECTION	2
01 6000	PRODUCT REQUIREMENTS	2
01 6300	PRODUCT OPTIONS AND SUBSTITUTIONS	4
01 7300	EXECUTION REQUIREMENTS	1
01 7329	CUTTING AND PATCHING	2
01 7400	CLEANING	1
01 7700	CLOSEOUT PROCEDURES	1
01 7800	CLOSE-OUT SUBMITTALS	3
01 7839	PROJECT RECORD DOCUMENTS	1

DIVISION 02 – EXISTING CONDITIONS

02 4100	DEMOLITION	4

DIVISION 03 - CONCRETE

03 3000	CAST-IN-PLACE CONCRETE	9
03 3515	DIAMOND POLISHED CONCRETE	4

03 4843	PRECAST ARCHITECTURAL CONCRETE	5

DIVISION 04 - MASONRY

04 0511	MASONRY MORTARING AND GROUTING	3
04 2000	UNIT MASONRY	8

DIVISION 05 - METALS

05 1200	STRUCTURAL STEEL FRAMING	5
05 3100	STEEL DECKING	3
05 4000	COLD-FORMED METAL FRAMING	4
05 4400	COLD-FORMED METAL TRUSSES	4
05 5000	METAL FABRICATIONS	3
05 5100	METAL STAIRS	4
05 5133	METAL LADDERS	2
05 5213	PIPE AND TUBE RAILINGS	3
05 7300	ORNAMENTAL HANDRAILS AND RAILINGS	5
05 7316	RAILING CABLE SYSTEMS	2

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 1000	ROUGH CARPENTRY	3
06 1636	WOOD PANEL PRODUCT SHEATHING	2
06 1643	GYPSUM SHEATHING	2
06 2000	FINISH CARPENTRY	2
06 6200	DECORATIVE PLASTIC SURFACING (SOLID PHENOLIC)	2

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 1113	BITUMINOUS DAMPPROOFING	2
07 1300	SHEET WATERPROOFING	3
07 1900	WATER REPELLENTS	2
07 2217	POLYISOCYANURATE ROOF BOARD INSULATION	3
07 2501	WEATHER RESISTANT MEMBRANES	2
07 2510	BITUMINOUS VAPOR BARRIER	1
07 2600	VAPOR BARRIERS	2
07 4264	METAL COMPOSITE MATERIAL WALL PANELS	8
07 4618	EXTERIOR METAL SOFFITS	2
07 6100	SHEET METAL ROOFING	5
07 6200	SHEET METAL FLASHING AND TRIM	2
07 6500	FLEXIBLE FLASHING	2
07 7123	MANUFACTURED GUTTERS AND DOWNSPOUTS	2
07 8400	FIRESTOPPING	3
07 9005	JOINT SEALERS	4

DIVISION 08 - OPENINGS

08 1113	HOLLOW METAL DOORS AND FRAMES	4
08 3100	ACCESS DOORS AND PANELS	2
08 4313	ALUMINUM-FRAMED STOREFRONTS	5
08 5113	ALUMINUM WINDOWS	6
08 7100	DOOR HARDWARE	6
08 8000	GLAZING	5

DIVISION 09 - FINISHES

09 2116	GYPSUM BOARD ASSEMBLIES	4
09 5100	ACOUSTICAL CEILINGS	4
09 6500	RESILIENT FLOORING	3
09 6700	EPOXY FLOORING	3
09 9000	PAINTING AND COATING	6
09 9656	EPOXY COATINGS	2

DIVISION 10 - SPECIALTIES

10 1416	BRONZE PLAQUE	1
10 1453	HANDICAPPED SIGNS	1
10 2813	TOILET ACCESSORIES	3
10 4116	EMERGENCY KEY CABINTES	1
10 4400	FIRE PROTECTION SPECIALTIES	2
10 7316	PRE-MANUFACTURED CANOPIES	2

DIVISION 14 – CONVEYING EQUIPMENT

14 4200	SHAFTWAY VERTICAL WHEELCHAIR LIFT	5

DIVISION 31 - EARTHWORK

31 1000	SITE CLEARING	2
31 2200	GRADING	2
31 2316	EXCAVATION	2
31 2316.13	TRENCHING	3
31 2323	FILL	5
31 3116	TERMITE CONTROL	2

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 1123	AGGREGATE BASE COURSES	3
32 1216	ASPHALT PAVING	3
32 1313	CONCRETE PAVING	4
32 1713	PARKING BUMPERS	1
32 1723.13	PAINTED PAVEMENT MARKINGS	2
32 1726	TACTILE WARNING SURFACING	1
32 9213	HYDROMULCHING	3
32 9223	SODDING	3

DIVISION 33 - UTILITIES

33 0513	MANHOLES AND STRUCTURES	2
33 4111	STORM DRAINAGE PIPING	2

00 0110

MEP TABLE OF CONTENTS

21 0000	FIRE PROTECTION SPRINKLER SYSTEM	9
22 0000	PLUMBING BASICS	3
22 0015	FIRE STOPPING AND SMOKE STOPPING	7
22 0030	ELECTRICAL REQUIREMENTS FOR PLUMBING	5
22 0086	PIPING INSULATION	16
22 0090	SUPPORTS, HANGERS, ANCHORS	10
22 0110	BASIC VALVES	6
22 0140	DOMESTIC WATER	8
22 0150	SANITARY WASTE AND VENT	5
22 0160	NATURAL GAS	8
23 0010	MECHANICAL GENERAL	16
23 0015	FIRE AND SMOKE STOPPING	6
23 0030	ELECTRICAL REQUIREMENTS FOR MECHANICAL	5
23 0075	MECHANICAL IDENTIFICATION	6
23 0086	PIPING INSULATION	16
23 0090	SUPPORTS, HANGERS, ANCHORS	10
23 0120	PIPING SPECIALTIES	4
23 0160	MECHANICAL SYSTEMS INSULATION	9
23 0184	REFRIGERANT PIPING	2
23 0710	HVAC SHEET METAL	6
23 0990	TESTING, ADJUSTING, BALANCING	7
26 0500	BASIC ELECTRICAL REQUIREMENTS	6
26 0510	ELECTRICAL DEMOLITION	3
26 0519	BUILDING WIRE & CABLE	6
26 0526	GROUNDING & BONDING	4
26 0529	SUPPORTING DEVICES	2
26 0533	CONDUIT	8
26 0534	BOXES	5
26 0535	EQUIPMENT WIRING SYSTEMS	3
26 0550	THROUGH-PENETRATION FIRESTOPPING FOR ELECTRICAL SYSTEMS	7
26 0553	ELECTRICAL IDENTIFICATION	3
26 0580	UTILITY SERVICE ENTERANCE	2
26 2300	DISTRIBUTION SWITCHBOARDS	5
26 2400	PANELBOARDS	4
26 2726	WIRING DEVICES	5
26 2813	FUSES	3
26 2816	ENCLOSED SWITCHES	3
26 2913	ENCLOSED MOTOR CONTROLLER	4
26 4113	LIGHTNING PROTECTION SYSTEMS	3
26 5100	INTERIOR LIGHTING	4
27 2000	VOICE/DATA NETWORK	4
28 3100	FIRE DETECTION AND ALARM SYSTEM	21

SECTION 00 0115
LIST OF DRAWING SHEETS

THE FOLLOWING DRAWINGS DATED AUGUST 23, 2024 BEARING THE ARCHITECT'S COMMISSION NUMBER 2405 WITH THESE SPECIFICATIONS FORM THE CONTRACT DOCUMENTS.

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

CIVIL
C001 ..... ARCHITECTURAL SITE DEMOLITION PLAN
C002 ..... ARCHITECTURAL SITE PLAN
C003 ..... SITE DETAILS
C101 ..... SWPPP
C201 ..... CIVIL SITE PLAN
C301 ..... CIVIL DEMOLITION PLAN
C401 ..... UTILITY PLAN
C501 ..... GRADING PLAN
C601 ..... DETAILS
C602 ..... DETAILS

LIFE SAFETY
LS001 ..... FIRST FLOOR LIFE SAFETY PLAN, CODE ANALYSIS
LS002 ..... SECOND FLOOR LIFE SAFETY PLAN

ARCHITECTURAL
A001 ..... DOOR SCHEDULE
A002 ..... HOLLOW METAL FRAME DETAILS
A003 ..... ALUMINUM FRAME SCHEDULE, WINDOW SCHEDULE, WINDOW DETAILS
A004 ..... ALUMINUM FRAME DETAILS
A005 ..... FIRST FLOOR FINISH PLAN, FINISH SCHEDULE
A006 ..... SECOND FLOOR FINISH PLAN, FINISH SCHEDULE
A007 ..... VISUAL WALL TYPES, WALL DETAILS
A100 ..... FIRST FLOOR PLAN
A101 ..... SECOND FLOOR PLAN
A102 ..... ROOF PLAN, ROOF DETAILS
A103 ..... ROOF DETAILS
A200 ..... EXTERIOR BUILDING ELEVATIONS
A201 ..... EXTERIOR BUILDING ELEVATIONS
A202 ..... BUILDING SECTIONS
A203 ..... BUILDING SECTIONS
A300 ..... ENLARGED STAIR PLANS, STAIR DETAILS
A301 ..... STAIR SECTION, LIFT SECTION
A302 ..... ENLARGED STAIR PLANS, STAIR SECTION & DETAILS
A400 ..... FIRST FLOOR REFLECTED CEILING PLAN
A401 ..... SECOND FLOOR REFLECTED CEILING PLAN
A500 ..... WALL SECTIONS
A501 ..... WALL SECTIONS
A502 ..... WALL SECTIONS
A503 ..... WALL DETAILS
A600 ..... STANDARD MOUNTING HEIGHTS, ADA NOTES
A601 ..... ENLARGED TOILET PLANS AND ELEVATIONS

STRUCTURAL

S100 ..... NOTE SHEET
S200 ..... FOUNDATION PLAN
S201 ..... FOUNDATION PLAN – LOBBY
S300 ..... FOUNDATION DETAILS
S301 ..... FOUNDATION DETAILS
S400 ..... SECOND FLOOR & ROOF FRAMING PLAN
S500 ..... FRAMING DETAILS
S501 ..... FRAMING DETAILS
S502 ..... FRAMING DETAILS
S503 ..... FRAMING DETAILS

MECHANICAL

M001..... MECHANICAL NOTES AND LEGENDS
M101..... HVAC PLANS
M102..... ENLARGED HVAC PLANS
M201..... MECHANICAL DETAILS I
M202..... MECHANICAL DETAILS II
M301..... MECHANICAL SCHEDULES

PLUMBING

P001 ..... PLUMBING NOTES, SCHEDULES, AND LEGENDS
P101 ..... PLUMBING PLANS
P102 ..... ENLARGED PLUMBING PLANS AND RISER
P201 ..... PLUMBING DETAILS I
P202 ..... PLUMBING DETAILS II
P203 ..... PLUMBING DETAILS III

FIRE PROTECTION

FP001 ..... FIRE PROTECTION GENERAL NOTES AND DETAILS
FP101 ..... FIRE SPRINKLER ZONE PLANS

ELECTRICAL

E101 ..... ELECTRICAL SYMBOLS
E102 ..... ELECTRICAL LIGHT FIXTURE SCHEDULE
E103 ..... ELECTRICAL SITE PLAN
E201 ..... ELECTRICAL PLANS – LIGHTING
E301 ..... ELECTRICAL PLANS – POWER & SYSTEMS
E401 ..... ELECTRICAL PLANS – SYSTEMS
E501 ..... ELECTRICAL PLANS – POWER
E601 ..... ELECTRICAL DETAILS
E701 ..... ELECTRICAL RISER DIAGRAMS
E702 ..... ELECTRICAL DETAILS
E703 ..... ELECTRICAL DETAILS
E704 ..... ELECTRICAL DIAGRAMS
E801 ..... ELECTRICAL PANEL SCHEDULES
E802 ..... ELECTRICAL PANEL SCHEDULES

End of List of Drawings

ADDENDUM NO. 1

PROJECT TITLE:	Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, Arkansas
OWNER:	Black River Technical College 1410 Highway 304E Pocahontas, AR 72455
OWNER'S REPRESENTATIVE:	Dr. Eggensperger, President (870) 248-4000
ARCHITECT:	Brackett-Krennerich and Associates P.A. 100 East Huntington Avenue, Suite D Post Office Box 1655 Jonesboro, Arkansas 72403-1655 (870) 932-0571 *office* •(870) 932-0975 *fax*
COMMISSION NUMBER:	2405
DATE OF ISSUE:	September 5, 2024
BID DATE/LOCATION:	September 17, 2024 at 2:00 p.m. C.D.S.T Richard Gaines Technology Center, Room BT113 (The Pocahontas Room) Black River Technical College 1410 Highway 304 East Pocahontas, AR 72455

Contractor shall take note of the following listed revisions and/or additions to the drawings and specifications for the above referenced project and adjust the contract sum accordingly. These revisions are hereby made a part of said documents and subsequent construction as if therein included.

ARCHITECTURAL

1. Specifications: Section 00 2100 – Instructions to Bidders

   A. Section 1.12 Time of Completion / Liquidated Damages; Replace Item A with the following:

   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. **All punch list items to be completed by December 1, 2024.**

STRUCTURAL

2. Drawings: Sheet S100 – Note Sheet
    A. Omit in its entirety and replace with page 3 of this addendum.

3. Drawings: Sheet S200 – Foundation Plan
    A. Omit in its entirety and replace with page 4 of this addendum.

4. Drawings: Sheet S201 – Foundation Plan – Lobby
    A. Omit in its entirety and replace with page 5 of this addendum.

5. Drawings: Sheet S300 – Foundation Details
    A. Omit in its entirety and replace with page 6 of this addendum.

6. Drawings: Sheet S301 – Foundation Details
    A. Omit in its entirety and replace with page 7 of this addendum.

7. Drawings: Sheet S400 – Second Floor & Roof Framing Plan
    A. Omit in its entirety and replace with page 8 of this addendum.

8. Drawings: Sheet S500 – Framing Details
    A. Omit in its entirety and replace with page 9 of this addendum.

9. Drawings: Sheet S501 – Framing Details
    A. Omit in its entirety and replace with page 10 of this addendum.

10. Drawings: Sheet S502 – Framing Details
    A. Omit in its entirety and replace with page 11 of this addendum.

11. Drawings: Sheet S503 – Framing Details
    A. Omit in its entirety and replace with page 12 of this addendum.

SECTION 00 1113

ADVERTISEMENT FOR BIDS

Qualified Contractors are invited to bid on a contract for **"Law Enforcement Training Academy, Black River Technical College, Pocahontas, Arkansas"**. The bids shall be on a lump sum basis.

Black River Technical College, hereinafter termed owner, will receive bids until **2:00 p.m., Tuesday, September 17, 2024.** Bids may be mailed or delivered in care of Rhonda Stone, Black River Technical College, 1410 Highway 304E, Pocahontas, AR 72455. Bids received after this time will not be accepted.

Bids will be publicly opened and read aloud at the stated time at the Richard Gaines Technology Center, Room BT113 (sometimes called the "Pocahontas Room").

Project scope consists of an approximately 18,900 SF Law Enforcement Training Academy Barracks. The building will consist of two floors, with double occupancy rooms in a suite design sharing shower/restrooms.

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.

BRTC 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 on **Tuesday, September 10, 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.

Rhonda Stone, VP Finance and Administration
Black River Technical College

SECTION 00 2100
INSTRUCTIONS TO BIDDERS

1.01 RECEIPT AND OPENING OF BIDS

A. Owner: Black River Technical College

B. Bid Location: **Richard Gaines Technology Center, Room BT113, 1410 HWY 304 East, Pocahontas, Arkansas**

C. Bid Date/Time: **September 17, 2024 at 2:00 p.m.**

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. **All punch list items to be completed by February 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 in parking lot north of Law Enforcement Physical Education Building) on Tuesday, September 10, 2024.**

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: Topographic Survey; Black River Technical College Main Campus, Pocahontas, Arkansas
   2. Date: August 2012
   3. Prepared by: DeClerk-Throesch Land Surveying
   4. Drawing #: 5 of 5

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

1.02 SUBSURFACE INVESTIGATION REPORT

A. A copy of a the preliminary Geotechnical information is included at the end of this section; the full report is available upon request:
   1. Title: Geotechnical Engineering Exploration: BRTC Law Enforcement Training Academy, Pocahontas, Arkansas
   2. Date: August 2, 2024
   3. Prepared By: MTA Engineers; 101 South Church, Jonesboro, AR 72401

B. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Brackett Krennerich Architects and structural engineer.

C. The recommendations described shall not be construed as a requirement of this Contract, unless specifically referenced in the contract Documents.

D. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Sum accruing to the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

MTA ENGINEERS

Geotechnical Engineering
Materials Testing • Special Inspections
Design

mtaengineers.com

GEOTECHNICAL ENGINEERING EXPLORATION

BRTC Law Enforcement Training Academy
Pocahontas, Arkansas

PREPARED FOR:

Todd Welch
Brackett-Krennerich Architects
100 East Huntington Avenue, Suite D
Jonesboro, AR 72401

PREPARED BY:

MTA ENGINEERS
101 S. Church St.
Jonesboro, AR 72401

August 2nd, 2024

MTA ENGINEERS

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Geotechnical Engineering • Materials Testing • Special Inspection • Design

Offices in: Little Rock, AR • Springdale, AR • Jonesboro, AR • Hoover, AL

August 2nd, 2024

Black River Technical College
Todd Welch
Brackett-Krennerich Architects
100 East Huntington Avenue, Suite D
Jonesboro, AR 72401

Subject: **Report of Geotechnical Engineering Exploration**
Black River Technical College Law Enforcement Training Academy
Pocahontas, Arkansas

Mr. Welch:

MTA Engineers has completed the authorized Geotechnical Engineering Exploration for the subject project. This work was conducted in accordance with the agreement between MTA Engineers and Todd Welch of Brackett-Krennerich Architects via MTA Engineers Proposal, dated May 3rd, 2024.

The purpose of our work was to explore general surface and subsurface conditions within the subject project site, and to gather and present data relative to the design and construction of the project located in Pocahontas, Arkansas. This report outlines the exploration procedures used, exhibits the data obtained, and presents our recommendations.

MTA Engineers appreciates this opportunity to provide these services and looks forward to working with you on future projects. Please contact us if you have any questions or require additional information.

Sincerely,

MTA ENGINEERS

Joseph Gray Spahn, PE
Project Engineer
Office +1 870-530-8380
grayspahn@mtaengineers.com

TABLE OF CONTENTS

SECTION

EXECUTIVE SUMMARY	4
INTRODUCTION	6
FIELD EXPLORATION	6
GENERAL SITE AND SUBSURFACE CONDITIONS	7
LABORATORY TESTING	8
ANALYSIS & RECOMMENDATIONS	8
• SITE PREPARATION	8
• STRUCTURAL FILL	9
• BUILDING FOUNDATIONS	9
• PAVEMENT DESIGN	10
• UN-COMPACTED FILL	11
• STUMP/ ORGANIC FINDINGS	11
• SEISMIC CONSIDERATION	12
• CONSTRUCTION PROCEDURES	12

APPENDICES

APPENDIX A: Boring Location Plan
APPENDIX B: Boring Logs
APPENDIX C: Key to Terms and Symbols
APPENDIX D: Laboratory Results
APPENDIX E: Seismic Design Criteria

TABLES

Table	Title	Page
1	Soil Types Encountered in Borings	4
2	General Strata Classification of Boring Logs	7
3	Pavement Design Assumption Values	10
4	Pavement design Recommendations	11

EXECUTIVE SUMMARY

The geotechnical exploration was conducted at a site located Northeast of the intersection of College Drive and Highway 304, in Pocahontas, Arkansas. The general topography of the site was flat, with the area consisting of mostly existing pavement and grass. In general, the soils consisted of mainly of silty sand, sand, poorly graded sand with silt, sandy silt/silt with sand, and sandy clay. Subsurface conditions were generally uniform throughout the entirety of the proposed development.
Major soil types encountered at each boring may be summarized as follows:

Table 1. Soil Types Encountered

SOIL TYPE	DESCRIPTION
CL	Sandy Clay
SM	Silty Sand
SP-SM	Poorly Graded Sand with Silt
SP	Sand
ML	Sandy Silt/Silt with Sand

See Table 2 General Strata Classification of Boring Logs or the individual boring logs found in Appendix B for a more detailed overview of the soils encountered on site.

It is assumed that the improvements will be constructed at or above the existing grades. The areas of improvements must be stripped of all organic containing soils in the order of **6-in.**

Based on the recommended site preparation (grades at or above existing), it is recommended that the building be supported on shallow footings founded a minimum of **24-in** beneath final exterior grade, bearing in properly compacted structural fill. Shallow foundations founded as accounted in the "Shallow Foundations" section of this report may be designed using a net allowable end bearing pressure of **1,500-psf** for continuous footings and **1,750-psf** for individual spread footings. This net allowable end bearing pressure is based on a factor of safety in excess of **2.5** with respect to the anticipated shear strength of the bearing stratum. Total and differential settlement is anticipated to be less than **½ -in**.

Some moisture sensitive soils (CL and ML), and possible loose sands were encountered on this site near possible bearing depths. The stability of these soils will greatly depend on the moisture conditions at the time of construction. Mass undercut is not expected, however some area of undercut may be necessary with approximate depths anticipated in the order of 2-ft, depending on conditions at the time of excavation.

SUMMARY

- **Rock/Hard Dig:**
  - No rock/hard dig soils were encountered.
  - Medium duty excavation equipment will be limited by depth.

- **Soils:**
  - Some onsite soils (CL, ML) at possible bearing depths are moisture sensitive.
  - Soft surface soils containing organics should be removed to a depth of **6-in**.

- **Foundations/Slabs:**
  - Shallow footings founded in structural fill, or moisture conditioned, properly compacted onsite soils, as accounted in the "Site Prep" section of this report, a minimum of **24-in** beneath final grade, may be respectively sized using a bearing capacity of **1,500-psf** and **1,750-psf** for continuous and individual spread footings, respectively.

- **Un-compacted Fill:**
  - No un-compacted fill was encountered during the exploration.

- **Pavement:**
  - Recommended pavement sections are presented within this report.
  - Subgrade should consist of moisture conditioned, properly compacted onsite soils or structural fill.
  - Areas of unstable soils may require over excavation.

- **Stump/Organic Findings:**
  - The potential to find stumps or other organic material beneath the surface is low.

- **Seismic Consideration:**
  - Based on IBC-2015, a **site class D** with a risk category II may be used for design purposes.

- **Miscellaneous:**
  - Potential exists for moisture to increase during wetter times of the year causing increased soil instability.
  - Construction debris was encountered in B6 at approximately 6".

INTRODUCTION

This exploration was requested in order to evaluate existing subsurface conditions and provide geotechnical design recommendations. The results of this exploration and the geotechnical design recommendations for site construction are presented in this report.

Exploration was accomplished by:

1. Borings at **7** locations up to **25-ft or auger refusal** to explore subsurface soil and groundwater conditions.
2. Obtaining samples from each stratum, within the accessible areas, using standard geotechnical sampling technique or standard penetration test.
3. Performing laboratory tests on various samples to determine pertinent engineering properties of the subsurface strata.
4. Analyzing field and laboratory test data to develop design recommendations.

The scope of this geotechnical exploration did not include an environmental assessment to determine the presence of wetlands and/ or hazardous or toxic materials in the soil or groundwater on or near this site. If there is concern of wetlands or a hazardous/ toxic material presence, a qualified environmental assessment consultant should be contacted to perform a site investigation before construction begins.

FIELD EXPLORATION

Subsurface conditions at the site were explored with borings up to a depth of **25-ft** at **7** boring locations. The approximate boring locations are shown on the Plan of Borings, Appendix A. Boring logs presenting descriptions of the soil strata encountered are included in Appendix B.

All soil samples encountered were removed from the field in moisture tight containers and transported to our laboratory for further examination. At the lab, a visual classification was performed for each sample. All various soil types were then analyzed for specific engineering properties.

GENERAL SITE AND SUBSURFACE CONDITIONS

The exploration, located Northeast of the intersection of College Drive and Highway 304, in Pocahontas, Arkansas, was conducted in the general area of the proposed improvements. The area of exploration was generally flat, with the area consisting of mostly existing pavement and grass. The stratigraphy encountered in the boring locations is summarized in Table 2. Subsurface conditions were consistent throughout the entirety of the areas explored.

For a more detailed description of soils encountered while testing see the boring log sheets found in Appendix B.

Table2. General Strata Classification of Boring Logs

STRATA	DEPTH	SOIL CLASSIFICATION	SOIL DESCRIPTION	SIGNIFICANT PROPERTIES
STRATUM I	0' to 18.5'	SM	Brown, Gray, Tan, Red Silty Sand	Very Loose – Medium Dense
STRATUM II	0' to 4'	ML	Brown, Gray, Red Sandy Silt/Silt with Sand	Soft - Firm
STRATUM III	4' to 6'	CL	Gray, Brown Sandy Clay	Firm
STRATUM IV	8' to 10' 18.5' to 20'	SP-SM	Gray, Tan Poorly Graded Sand with Silt	Loose – Medium Dense
STRATUM V	18.5' to 25'	SP	Tan, Gray, Brown Sand	Very Loose – Medium Dense

The potential exists for increased ground water to develop during wetter seasons. The significant properties and characteristics of the subsurface strata pertinent to design and constructions are:

A. The anticipated bearing loads.
B. Moisture sensitive nature of ML and CL soils found onsite.
C. Soft/loose onsite soils encountered in some areas.
D. Final design elevations.

LABORATORY TESTING

Descriptions of the soils encountered in the sample locations were prepared in general accordance with applicable ASTM standards. The soil stratification shown on the Boring Log Reports represents soil conditions at the specific sample locations. Possible variations occur between or beyond the sample location.

The stratification lines on the Boring Log represent the approximative boundaries between soil types, but actual transitions between soil layers in the stratification of the proposed site may be gradual.

Laboratory testing was performed to verify/ evaluate the response of the cohesive soil to stress, classification and to determine water content. The results of all testing performed are presented in Appendix D Laboratory Test Summary.

ANALYSIS AND RECOMMENDATIONS

SITE PREPARATION

Based on the soil conditions at the time of excavation the site should be stripped/grubbed **6-in** to remove all organics. The existing pavement should also be removed. All stripped areas should be scarified, moisture conditioned, and recompacted to a minimum of **95%** of the materials standard proctor (ASTM D-698).

Areas of proposed buildings and paving should be "proof rolled" using a 62,000lb equivalent load before the addition of any fill. Proof roll should be observed by a representative of MTA Engineers to determine any areas of instability. Any instability should be assessed by the soils engineer and means of mitigation determined to include over-excavation and backfill using structural fill, chemical soils stabilization or a combination of both. Areas of instability will greatly depend on the condition of the soil at the time of construction. Onsite soils of Stratum II and III are moisture sensitive. Increased soil moisture will result in greater areas of instability. Excavation should be performed under dry conditions, using equipment adequate to perform the work. Medium construction equipment should be adequate to perform the work needed. Positive drainage must be maintained during construction to prevent inundation. Backfill and fill should be placed in accordance with the Structural Fill section of this report.

Some areas of undercut is expected on this site. MTA expects depths in the order of 2-ft. Raising of site grades will decrease undercut quantities. MTA Engineers should be contacted during the excavation to determine if in-situ soils are adequate for bearing.

STRUCTURAL FILL

Fill should consist of approved materials, which are free of organic matter and debris. For approval, samples of the proposed fill material should be submitted to MTA Engineers for classification testing. Select fill, consisting of low plasticity (lean clay) soil or clayey gravel, classifying as SC, CL, or GC according to the Unified Soils Classification System are generally considered suitable. High plasticity clay soils (soils with a Liquid Limit above 50) should not be used. Rock fragments that are greater than four (4") inches for the building or six (6") inches for the parking and drive areas should not be included in engineered fill. Select fill should have a Plasticity Index between ten (10) and twenty-five (25) and a Liquid Limit no greater than fifty (50).

Placement of approved fill should be achieved in multiple thin lifts. Each lift should not exceed twelve (12") inches in loose thickness. Compaction of these lifts should be performed with suitable equipment to achieve 95% of modified proctor (ASTM D-1557) at 2% below to 3% above optimum moisture content depending on the type of material used for fill. Thinner lifts may be required based on the compaction equipment being used. Care should be taken that all compaction recommendations are performed.

If cohesive fill is to be used, compaction should be performed using a kneading-type vibratory compactor such as a vibratory sheepsfoot. The material should be broken down sufficiently to provide a dense matrix of particles. Fragments should be no larger than four (4") inches under the building pads and roadways.

BUILDING FOUNDATIONS

All foundations must satisfy two basic and independent design criteria. First, foundations must have an acceptable factor of safety against bearing failure under maximum design loads. Secondly, movement of the foundation due to consolidation, shrinkage, and/or swelling of the supporting strata should not exceed tolerable limits for the structure. Construction factors such as installation of foundations units, excavation procedures, and surface and groundwater conditions should also be considered.

The factors and the aforementioned subsurface conditions were influential in the development of the following recommendation. In view of the anticipated foundation loading and subsurface conditions encountered, it is recommended that the proposed structures be supported on a foundation system designed in accordance with the following recommendations.

FOUNDATIONS/ SLABS

Shallow Foundations (Constructed at or above existing grade)

It is recommended that the proposed structure be supported on traditional shallow footings founded a minimum of **24-in** beneath final grade, upon moisture conditioned, properly compacted onsite soils or structural fill placed in accordance with the "Structural Fill" section of this report. In addition, to minimize the potential for localized shear failure within the soils, a minimum footing width of **24-in** is recommended.

Shallow foundations as accounted may be designed using a net allowable end bearing pressure of **1,500-psf** for continuous footings and **1,750-psf** for individual spread footings if founded in moisture conditioned, properly compacted onsite soils or structural fill placed per this report. The net allowable end bearing pressures will be based on a factor or safety in excess of **2.5**. Total and differential settlement is anticipated to be less than **½ -in**.

Slab-on-grade type construction is considered appropriate for the floor slab. We recommend that the slab be supported on **4-in** of clean crushed stone or gravel (ASTM C-33 #57 or equivalent) on prepared subgrade. A Class A impervious moisture barrier with a minimum thickness of **10-mils**, specified according to ASTM E-1745, should be provided between slab and the granular fill due to the potential for perched water to develop during the wetter seasons.

Subgrade soils under the slab and within footings should be evaluated by the geotechnical engineers from MTA Engineers to verify proper bearing.

PAVEMENT DESIGN

Paved parking and drives will be constructed as part of the project. Design traffic volumes and loadings have not been determined. However, we anticipate that the asphalt drives will be subject to light vehicles and daily school buses. We anticipate that the drives will be placed at/or above the existing elevation.

Areas of proposed pavement should be prepared in accordance with the "Site Preparation" of this report.

The following design criteria were used to develop the recommended pavement sections in conjunction with the AASHTO Design Guide 1996:

Table 3. Pavement Design Assumption Values

PAVEMENT DESIGN ASSUMPTION VALUES	
CBR	5
R-VALUE	15
SOIL SUPPORT VALUE (S)	5

Based on information obtained during this study, subgrade soils in the paved areas should generally consist of structural fill or moisture conditioned, properly compacted onsite soils. Fill, where required, should be placed as recommended in the Structural Fill section of the report. Over excavation in areas of proposed paving may be necessary depending on soil conditions at the time of construction.

As previously stated, any organic containing soil should be stripped off in the order of **6-in**. It is recommended that positive site drainage should be provided during construction and be incorporated during the final design.

Table 4. Pavement Design Recommendations

PAVEMENT DESIGN RECOMMENDATIONS	
Standard Duty Asphalt Paving	3-in ACHM Surface Course
	8-in Crushed Stone Base Course
	12-in Approved Subgrade
Heavy Duty Asphalt Paving	4-in ACHM Surface Course
	8-in Crushed Stone Base Course
	12-in Approved Subgrade
Standard Duty Concrete Paving	5-in Concrete Pavement
	6-in Crushed Stone Base Course
	12-in Approved Fill Subgrade
Heavy Duty Concrete Paving and Dumpster Pad	6-in Concrete Pavement
	8-in Crushed Stone Base Course
	12-in Approved Fill Subgrade

Notes: It should be recognized that periodic maintenance of pavement will be required. As a minimum, this should include periodic sealing of all joints and cracks to prevent surface water infiltration.

UN-COMPACTED FILL

No un-compacted fill was encountered on the property during our exploration. The site preparation section of this report outlines procedures for subgrade preparation.

STUMP/ ORGANIC FINDINGS

No subsurface organics were encountered during our exploration.

SEISMIC CONSIDERATION

Based on IBC-2015, a site soil **Class D** with a risk category II may be used for design purposes. Additional design information on Seismic Consideration is attached as Appendix E.

CONSTRUCTION PROCEDURES

The potential exists for ground water to develop during wetter seasons. Therefore, foundations excavation and any other site grading should be performed during drier periods to reduce the possibility of changes in conditions.

Care should be taken to provide positive drainage during and after construction. All roof run-off should be collected in gutter systems. Down spouts should direct water a minimum of 5-ft from the building before discharge.

All areas that will be paved should be proof rolled at final subgrade elevation before the addition of aggregate base, and at the final aggregate base elevation before paving. Any areas of instability should be addressed at these times.

Subsurface conditions significantly at variance with those encountered within the borings should be brought to the attention of the engineer, and work delayed pending evaluation and/or preparation of additional recommendations, if warranted.

♦ ♦ ♦ ♦

The following illustrations are attached and complete this report:

Appendix A: Plan of Borings
Appendix B: Borings Logs
Appendix C: Key to terms and Symbols
Appendix D: Laboratory Results
Appendix E Seismic Design Criteria

♦ ♦ ♦ ♦

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Appendix A:
Boring Location Plan

B6
B7
B1
B4
B3
B2
B5
College Dr
College Dr
College Dr
College Dr
Black River Technical College - Law
Carter Ln
304
304
300 ft

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Appendix B: Boring Logs

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Boring Log Report

BORING NO. B1
PAGE 1 OF 1

JOB NO. 24 105
JOB NAME: BLACK RIVER TECHNICAL COLLEGE
COORDINATES: NORTH: _____ EAST: _____
STATION: _____
LOCATION: POCAHONTAS, AR

DATE: 7/1/2024
TYPE OF DRILLING: HOLLOW STEM
EQUIPMENT: TMG CSR-174 DRILL RIG
LOGGED BY: B. PUTT
DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 2-IN ASPHALT APPROX. 6-IN LIMESTONE GRAVEL BASE BROWN, GRAY SILTY SAND	SM	15	14.3	17	2	57.0	5 6-8	14
			GRAY, BROWN SANDY SILT WITH CLAY	ML						10 5-5	10
5			BROWN, GRAY SILTY SAND							8 5-7	12
										11 7-6	13
										25 15-7	22
10			TAN, GRAY SILTY SAND	SM							
15										5 WOH-1	
20			TAN, GRAY SAND	SP	NP	24.0	NV		4.7	3 8-10	18
25			TAN, GRAY SAND ABOVE 24-FT GRAY SAND BELOW 24-FT							6 6-5	11
			Boring Terminated								
30											

COMPLETION DEPTH: 25 WATER DEPTH> INITIAL: 18.5 AFTER 24 HOURS:

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BORING NO. B2
PAGE 1 OF 1

JOB NO. 24 105
JOB NAME: BLACK RIVER TECHNICAL COLLEGE
COORDINATES: NORTH: _____ EAST: _____
STATION:
LOCATION: POCAHONTAS, AR

DATE: 7/1/2024
TYPE OF DRILLING: HOLLOW STEM
EQUIPMENT: TMG CSR-174 DRILL RIG
LOGGED BY: B. PUTT
DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 2-IN ASPHALT APPROX. 6-IN LIMESTONE GRAVEL BASE/ BROWN, GRAY SILTY SAND	SM	NP	9.3	NV		23.1	9 10-15	25
			BROWN, RED SANDY SILT WITH CLAY	ML						6 4-6	10
5			RED, TAN SILTY SAND	SM						2 2-4	6
										5 7-6	13
10			TAN, GRAY SILTY SAND							4 5-6	11
15			BROWN, GRAY SILTY SAND		NP	32.5	NV		20.5	1 WOH-1	
20			BROWN SAND	SP						1 6-9	15
25					NP	22.9	NV		2.0	2 1-2	3
30			Boring Terminated								

COMPLETION DEPTH: 25 WATER DEPTH> INITIAL: 13.5 AFTER 24 HOURS:

REMARKS:

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Boring Log Report

BORING NO. B3

PAGE 1 OF 1

JOB NO. 24 105

JOB NAME: BLACK RIVER TECHNICAL COLLEGE

COORDINATES: NORTH: _____ EAST: _____

STATION: _____

LOCATION: POCAHONTAS, AR

DATE: 7/2/2024

TYPE OF DRILLING: HOLLOW STEM

EQUIPMENT: TMG CSR-174 DRILL RIG

LOGGED BY: B. PUTT

DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 2-IN ASPHALT APPROX. 6-IN LIMESTONE GRAVEL BASE RED, BROWN SILTY SAND	SM						8 6-6	12
			RED, BROWN SANDY SILT	ML						4 2-2	4
5			RED, TAN SILTY SAND							4 4-5	9
					NP	12.1	NV		14.1	5 6-7	13
										4 6-6	12
10			TAN, GRAY SILTY SAND	SM							
					NP	32.5	NV		30.6	2 WOH-WOH	
15			BROWN SILTY SAND								
20			BROWN SAND	SP	NP	29.3	NV		2.4	4 2-4	6
			Boring Terminated								
25											
30											

COMPLETION DEPTH: 20 WATER DEPTH> INITIAL: 13.5 AFTER 24 HOURS:

REMARKS: SAMPLE AT 23.5-FT COULD NOT BE RETRIEVED DUE TO SANDLOCKING OF BORING.

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Boring Log Report

BORING NO. B4
PAGE 1 OF 1

JOB NO. 24 105
JOB NAME: BLACK RIVER TECHNICAL COLLEGE
COORDINATES: NORTH: _____ EAST: _____
STATION: _____
LOCATION: POCAHONTAS, AR

DATE: 7/2/2024
TYPE OF DRILLING: HOLLOW STEM
EQUIPMENT: TMG CSR-174 DRILL RIG
LOGGED BY: B. PUTT
DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 2-IN ASPHALT APPROX. 6-IN LIMESTONE GRAVEL BASE/ BROWN SILTY SAND							11	19
			GRAY, BROWN SILTY SAND	SM						8-11 7 7-5	12
5			GRAY, BROWN SANDY CLAY	CL	22	22.7	41	19	75.1	2 2-5	7
			GRAY, BROWN SILTY SAND		NP	14.4	NV		20.5	3 5-6	11
10			BROWN SILTY SAND	SM						5 7-7	14
15			GRAY, BROWN SILTY SAND UNTIL 14-FT TAN SILTY SAND AFTER 14-FT							2 1-WOH	
20			GRAY POORLY GRADED SAND WITH SILT	SP-SM	NP	22.5	NV		6.5	4 3-3	6
			Boring Terminated								
25											
30											

COMPLETION DEPTH: 20 WATER DEPTH> INITIAL: 14.0 AFTER 24 HOURS:

REMARKS: SAMPLE AT 23.5-FT COULD NOT BE RETRIEVED DUE TO SANDLOCKING OF BORING.

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Boring Log Report

BORING NO. B5
PAGE 1 OF 1

JOB NO. 24 105
JOB NAME: BLACK RIVER TECHNICAL COLLEGE
COORDINATES: NORTH: _____ EAST: _____
STATION: _____
LOCATION: POCAHONTAS, AR

DATE: 7/2/2024
TYPE OF DRILLING: HOLLOW STEM
EQUIPMENT: TMG CSR-174 DRILL RIG
LOGGED BY: B. PUTT
DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 2-IN ASPHALT APPROX. 6-IN LIMESTONE GRAVEL BASE								
			BROWN, GRAY SILTY SAND	SM	NP	13.5	NV		17.3	7 6-5 4 2-3	11 5
5			GRAY, BROWN, TAN SANDY SILTY CLAY	CL						8 3-5	8
					NP	16.0	NV		28.2	4 4-6	10
					NP	13.7	NV		12.2	5 8-9	17
10			GRAY, BROWN SILTY SAND	SM							
										2 WOH-1	
15			GRAY, BROWN SILTY SAND UNTIL 14-FT GRAY SILTY SAND AFTER 14-FT								
20			GRAY SAND	SP						2 1-1	2
			Boring Terminated								
25											
30											

COMPLETION DEPTH: 20 WATER DEPTH> INITIAL: 13.5 AFTER 24 HOURS:

REMARKS: SAMPLE AT 23.5-FT COULD NOT BE RETRIEVED DUE TO SANDLOCKING OF BORING.

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Boring Log Report

BORING NO. B6
PAGE 1 OF 1

JOB NO. 24 105
JOB NAME: BLACK RIVER TECHNICAL COLLEGE
COORDINATES: NORTH: _____ EAST: _____
STATION: _____
LOCATION: POCAHONTAS, AR

DATE: 7/2/2024
TYPE OF DRILLING: HOLLOW STEM
EQUIPMENT: TMG CSR-174 DRILL RIG
LOGGED BY: B. PUTT
DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 3-IN ORGANICS BROWN, GRAY SANDY SILT AFTER 3-IN CONSTR. DEBRIS ENCOUNTERED AT APPROX. 6-IN	ML	NP	10.2	NV		51.9	2 6-5	11
										5 3-3	6
5			BROWN, TAN, GRAY SILTY SAND		NP	14.4	NV		17.3	3 4-8	12
				SM						6 5-6	11
10			TAN, GRAY SILTY SAND							5 4-4	8
			Boring Terminated								
15											
20											
25											
30											

COMPLETION DEPTH: 10 WATER DEPTH> INITIAL: AFTER 24 HOURS:

REMARKS:

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Boring Log Report

BORING NO. B7
PAGE 1 OF 1

JOB NO. 24 105
JOB NAME: BLACK RIVER TECHNICAL COLLEGE
COORDINATES: NORTH: _____ EAST: _____
STATION: _____
LOCATION: POCAHONTAS, AR

DATE: 7/2/2024
TYPE OF DRILLING: HOLLOW STEM
EQUIPMENT: TMG CSR-174 DRILL RIG
LOGGED BY: B. PUTT
DRILLED BY: P. KING

DEPTH FT.	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL SURFACE ELEVATION:	SOIL GROUP	PLASTIC LIMIT	% MOIST.	LIQUID LIMIT	PLASTIC LIMIT	PERCENT PASSING #200	NO. OF BLOWS PER 6-IN.	N-Value
			APPROX. 3-IN ORGANICS BROWN SILT WITH SAND	ML						4 6-6	12
			BROWN SILTY SAND		16	9.6	18	2	36.9	7 4-4	8
5			RED, BROWN, GRAY SILTY SAND	SM						2 1-2	3
			BROWN, RED SILTY SAND		NP	16.8	NV		17.8	5 6-7	13
10			TAN, GRAY POORLY GRADED SAND WITH SILT	SP-SM	NP	17.0	NV		10.4	5 5-6	11
			Boring Terminated								
15											
20											
25											
30											

COMPLETION DEPTH: 10 WATER DEPTH> INITIAL: AFTER 24 HOURS:

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Appendix C: Key to Terms

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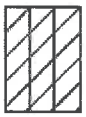
TERMS AND SYMBOLS USED ON BORING LOGS

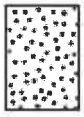
SOIL TYPES

CLAY (CH)

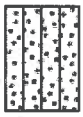

SILTY CLAY (CL)

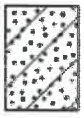
CLAY (CL)

SANDY CLAY (CL)


WELL-GRADED SAND (SW)

POORLY-GRADED SAND (SP)


SILTY SAND (SM)


CLAYEY SAND (SC)

WELL-GRADED GRAVEL (GW)

POORLY-GRADED GRAVEL (GP)

SILTY GRAVEL (GM)

SANDY SILT (ML)

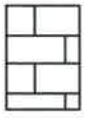
CLAYEY GRAVEL (GC)

SILT (ML)

SILT (MH)

FILL MATERIAL

ROCK TYPES


LIMESTONE

SHALE

SANDSTONE

WEATHERED LIMESTONE

WEATHERED SHALE

WEATHERED SANDSTONE

SAMPLER TYPE

SHELBY TUBE SAMPLE

SPLIT SPOON SAMPLE

AUGER SAMPLE

NO RECOVERY

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SOIL GRAIN SIZE

U.S. STANDARD SIEVE								
12"	3"	3/4"	4	10	40	200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		
304	76.2	19.1	4.75	2	0.42	0.074	0.002	
SOIL GRAIN SIZE IN MILIMETERS								

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No 200 sieve): Includes (1) clean gravels and sands, and (2) silty clayey gravels and sands condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERMS	N VALUE	RELATIVE DENSITY
VERY LOOSE	0-4	0 – 15 %
LOOSE	4-10	15 – 35 %
MEDIUM DENSE	10-30	35 – 65 %
DENSE	30-50	65 – 85 %
VERY DENSE	50 and above	85 – 100 %

FINE GRAINED SOILS (major portion passing No 200 sieve): include (1) inorganic and organic silt and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer reading or by unconfined compression tests.

DESCRIPTIVE TERMS	N VALUE	UNCONFINED COMPRESSIVE STRENGTH TON / SQ. FT.
VERY SOFT	0-3	less than 0.25
SOFT	3-6	0.25 - 0.50
FIRM	6-12	0.50 - 1.00
STIFF	13-20	1.00 - 2.00
VERY STIFF	20-50	2.00- 4.00
HARD	50 and above	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above because of planes of weakness or cracks in the soil. The consistency rating of such soils are based on penetrometer readings

TERMS CHARACTERIZING MOISTURE CONTENT

DRY: No water evident in sample; fines less than plastic limit.
MOIST: Sample feels damp; fines near the plastic limit.
VERY MOIST: Water visible on sample; fines greater than plastic limit and less than liquid limit.
WET: Sample bears free water; fines greater than liquid limit.

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED: Having inclined planes of weakness that are slick and glassy in appearance.
FISSURED: Containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
LAMINATED: Composed of thin layer of varying color and texture.
INTERBEDDED: Composed of alternate layers of different soil types
CALCAREOUS: Containing appreciable quantities of calcium carbonate.
WELL GRADED: Having wide range in grain sizes and substantial amounts of all intermediate particle size.
POORLY GRADED: Predominantly of one grain size, or having a range of sizes with some intermediate size missing

---

Terms used in this report for describing soils according to their texture or grain size distribution are in accordance with UNIFIED SOIL CLASSIFICATION SYSTEM as described in technical Memorandum No 3-357, Waterways Experiment Station, March 1953

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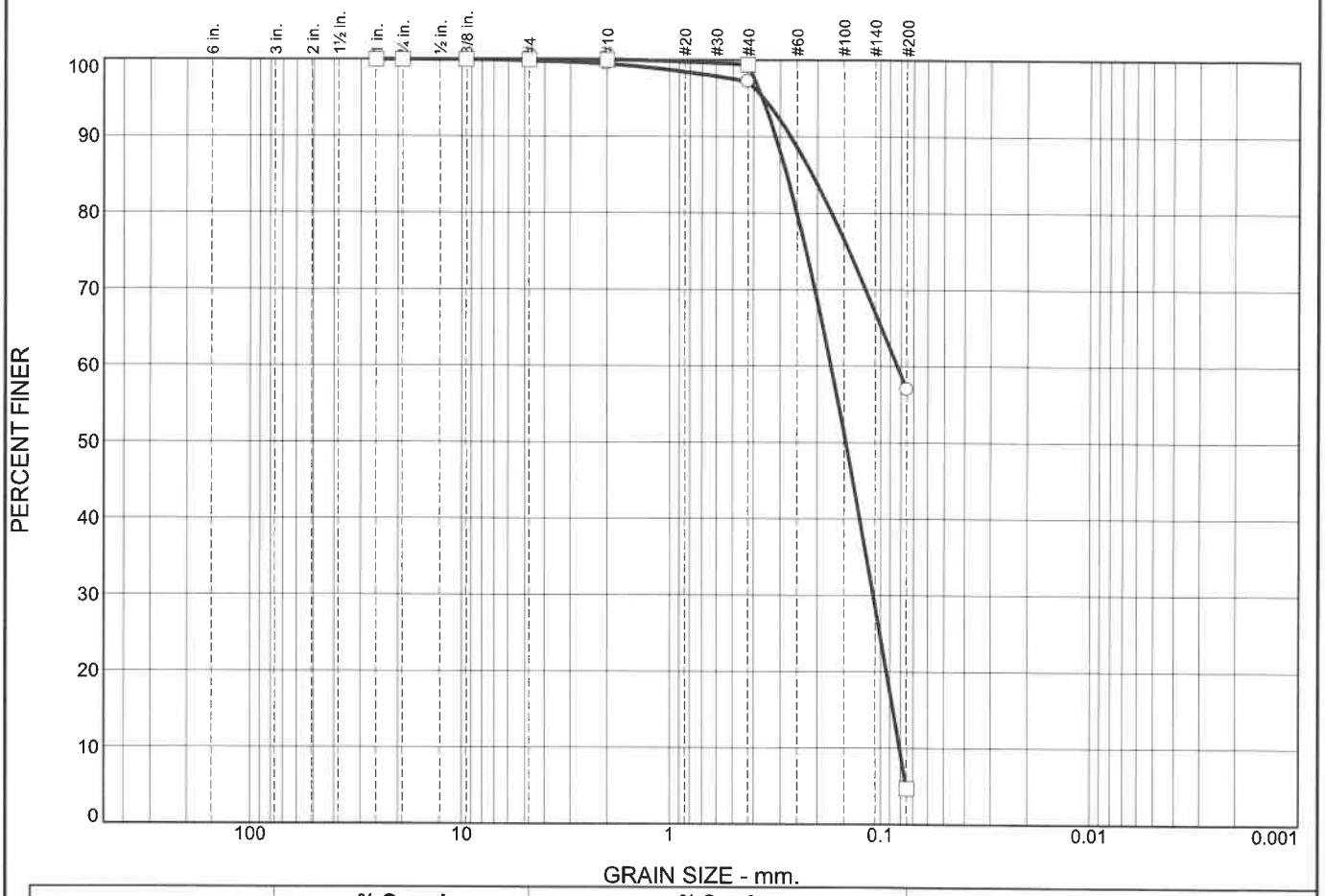
Appendix D: Laboratory Results

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.2	0.4	2.2	40.2	57.0	
□	0.0	0.0	0.0	0.0	0.6	94.7	4.7	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	17	15	0.2109	0.0832						
□	NV	NP	0.2784	0.1722	0.1463	0.1080	0.0869	0.0809	0.84	2.13

Material Description	USCS	AASHTO
○ GRAY, BROWN SANDY SILT WITH CLAY	ML	A-4(0)
□ TAN, GRAY SAND	SP	A-3

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

○ **Source of Sample:** B1 **Depth:** 2

□ **Source of Sample:** B1 **Depth:** 18.5

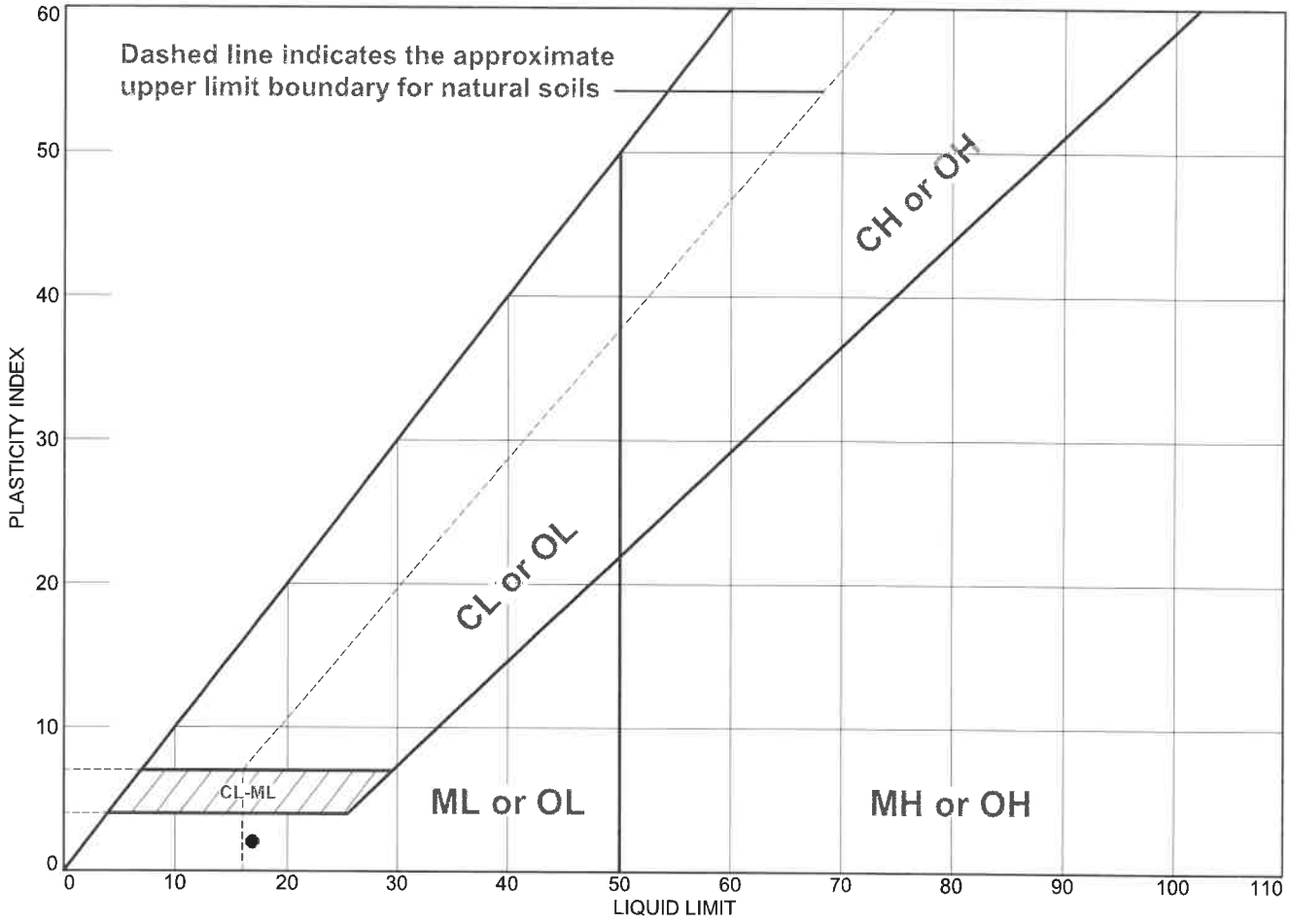
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY, BROWN SANDY SILT WITH CLAY	17	15	2	97.2	57.0	ML
■	TAN, GRAY SAND	NV	NP	NP	99.4	4.7	SP

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B1 **Depth:** 2

■**Source of Sample:** B1 **Depth:** 18.5

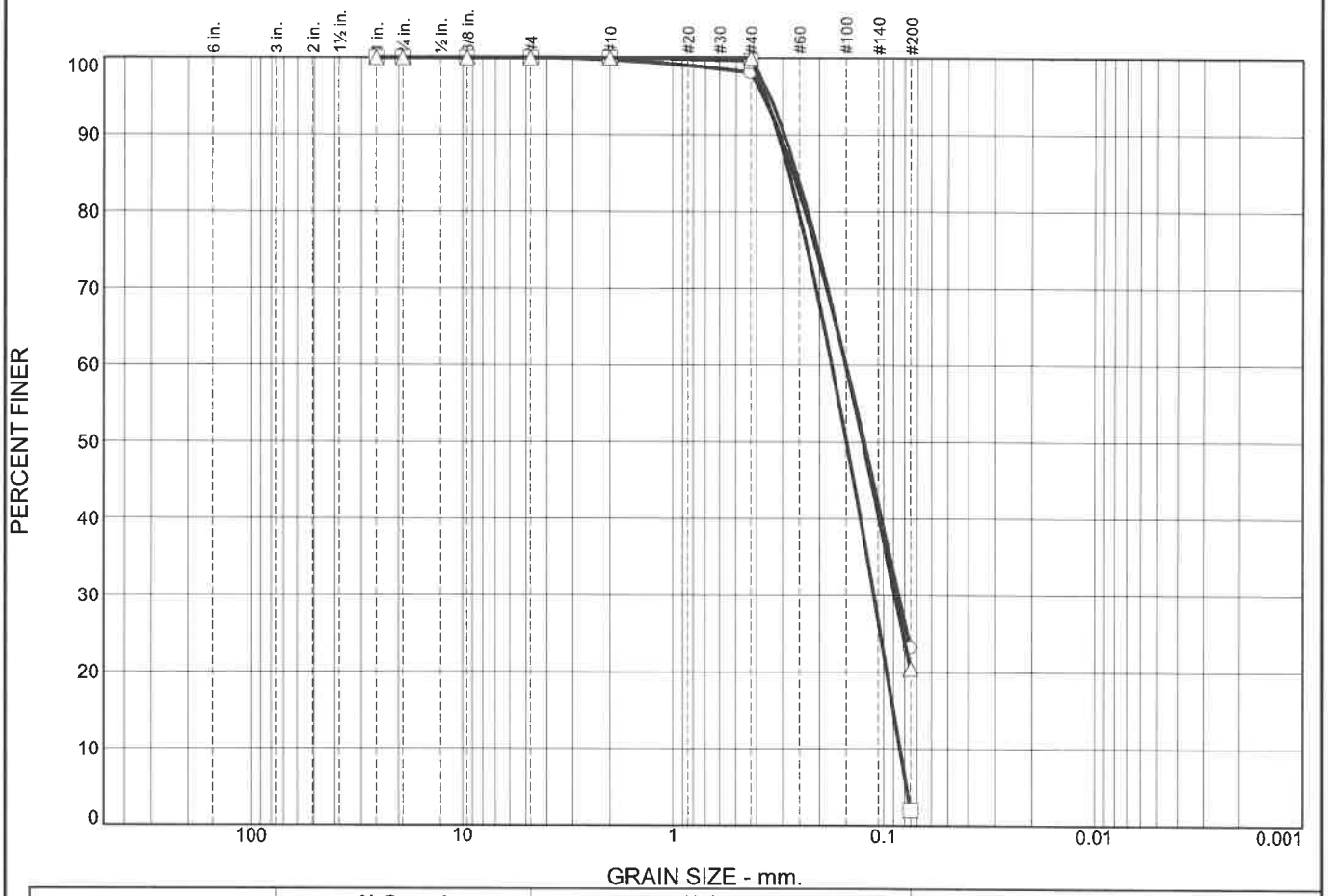
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.3	1.6	75.0	23.1	
□	0.0	0.0	0.0	0.0	0.4	97.6	2.0	
△	0.0	0.0	0.0	0.0	0.0	79.5	20.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.2665	0.1497	0.1231	0.0849				
□	NV	NP	0.2793	0.1748	0.1491	0.1109	0.0897	0.0837	0.84	2.09
△	NV	NP	0.2572	0.1502	0.1249	0.0882				

	Material Description	USCS	AASHTO
○	BROWN, GRAY SILTY SAND	SM	A-2-4(0)
□	BROWN SAND	SP	A-3
△	BROWN, GRAY SILTY SAND	SM	A-2-4(0)

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

Remarks:

○ **Source of Sample:** B2 **Depth:** 0.67

□ **Source of Sample:** B2 **Depth:** 23.5

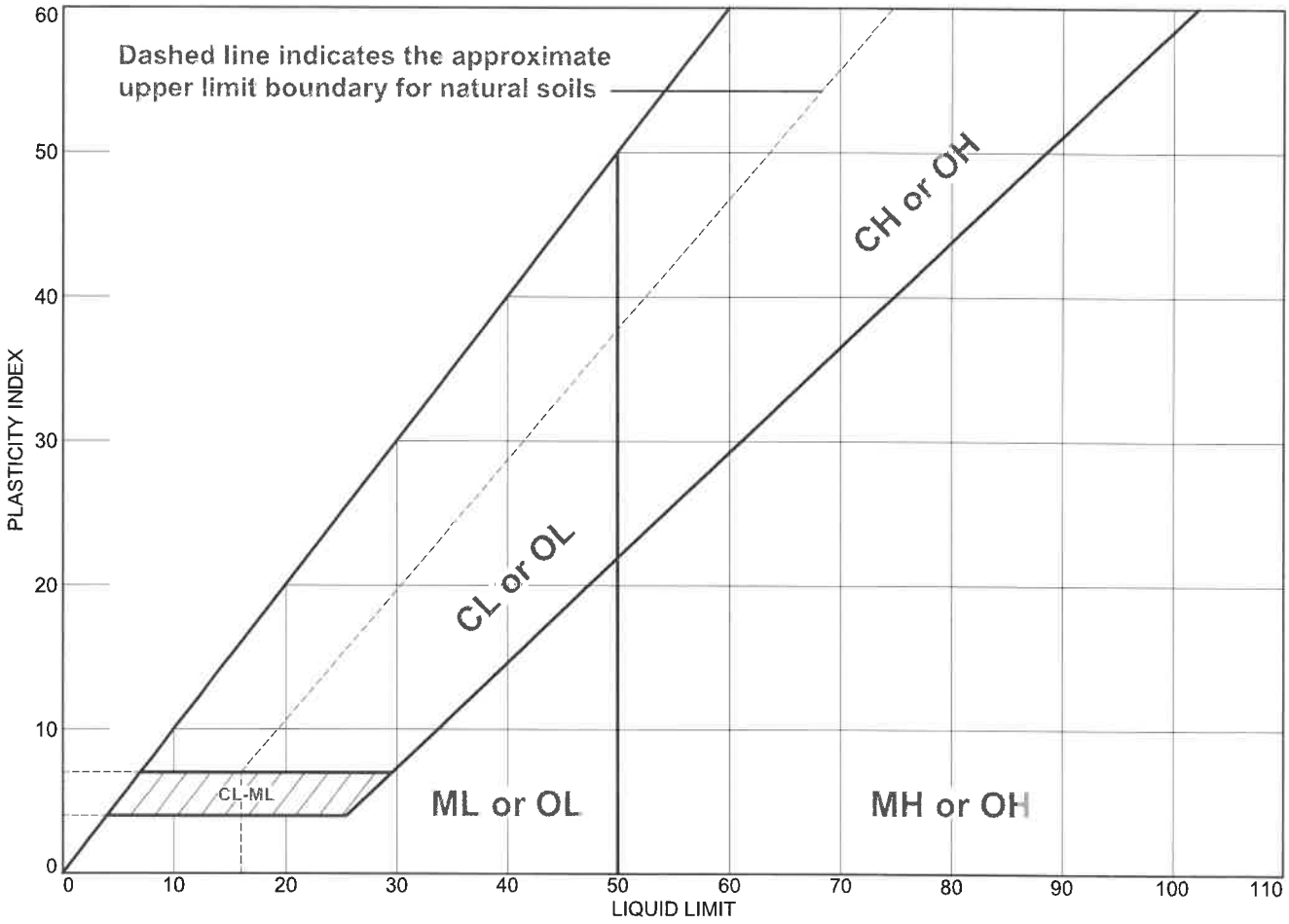
△ **Source of Sample:** B2 **Depth:** 13.5

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN, GRAY SILTY SAND	NV	NP	NP	98.1	23.1	SM
■	BROWN SAND	NV	NP	NP	99.6	2.0	SP
▲	BROWN, GRAY SILTY SAND	NV	NP	NP	100.0	20.5	SM

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B2 **Depth:** 0.67
■**Source of Sample:** B2 **Depth:** 23.5
▲**Source of Sample:** B2 **Depth:** 13.5

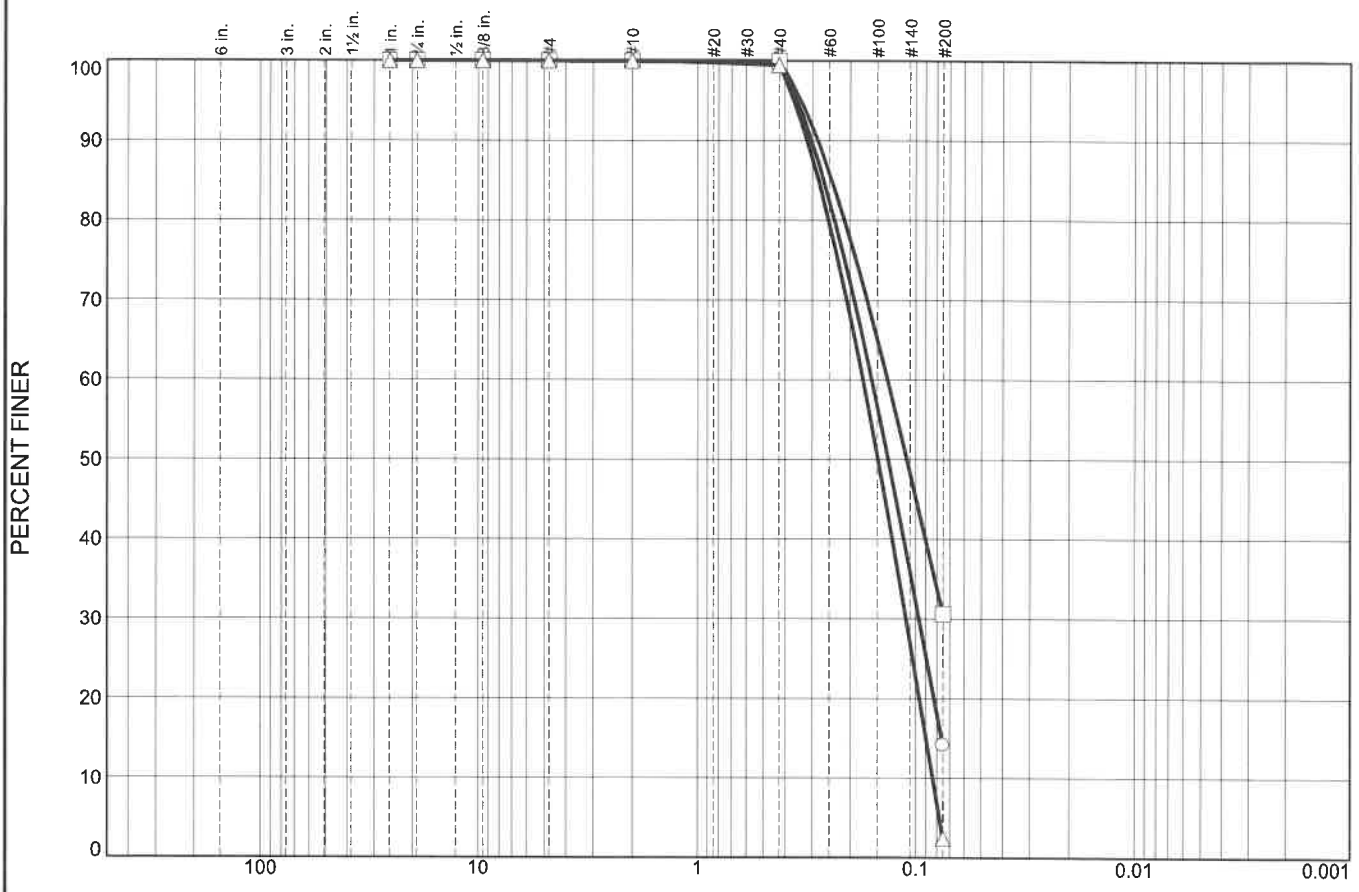
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	0.0	85.8	14.1	
□	0.0	0.0	0.0	0.0	0.0	69.4	30.6	
△	0.0	0.0	0.0	0.0	0.5	97.1	2.4	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.2652	0.1591	0.1337	0.0963	0.0760			
□	NV	NP	0.2434	0.1347	0.1097					
△	NV	NP	0.2800	0.1747	0.1489	0.1106	0.0894	0.0834	0.84	2.10

Material Description	USCS	AASHTO
○ TAN, GRAY SILTY SAND	SM	A-2-4(0)
□ BROWN SILTY SAND	SM	A-2-4(0)
△ BROWN SAND	SP	A-3

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

○ **Source of Sample:** B3 **Depth:** 6

□ **Source of Sample:** B3 **Depth:** 13.5

△ **Source of Sample:** B3 **Depth:** 18.5

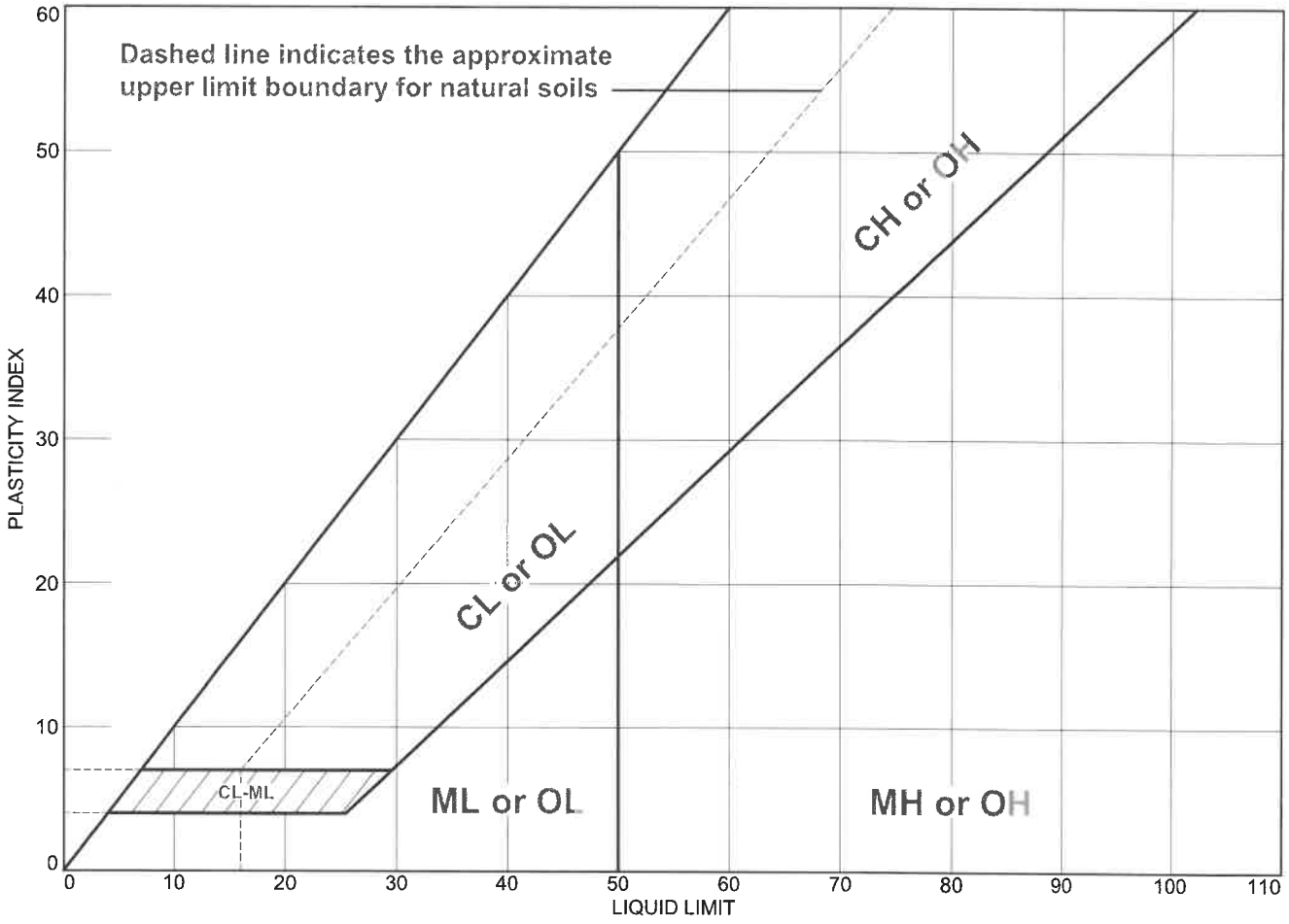
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	TAN, GRAY SILTY SAND	NV	NP	NP	99.9	14.1	SM
■	BROWN SILTY SAND	NV	NP	NP	100.0	30.6	SM
▲	BROWN SAND	NV	NP	NP	99.5	2.4	SP

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B3 **Depth:** 6
■**Source of Sample:** B3 **Depth:** 13.5
▲**Source of Sample:** B3 **Depth:** 18.5

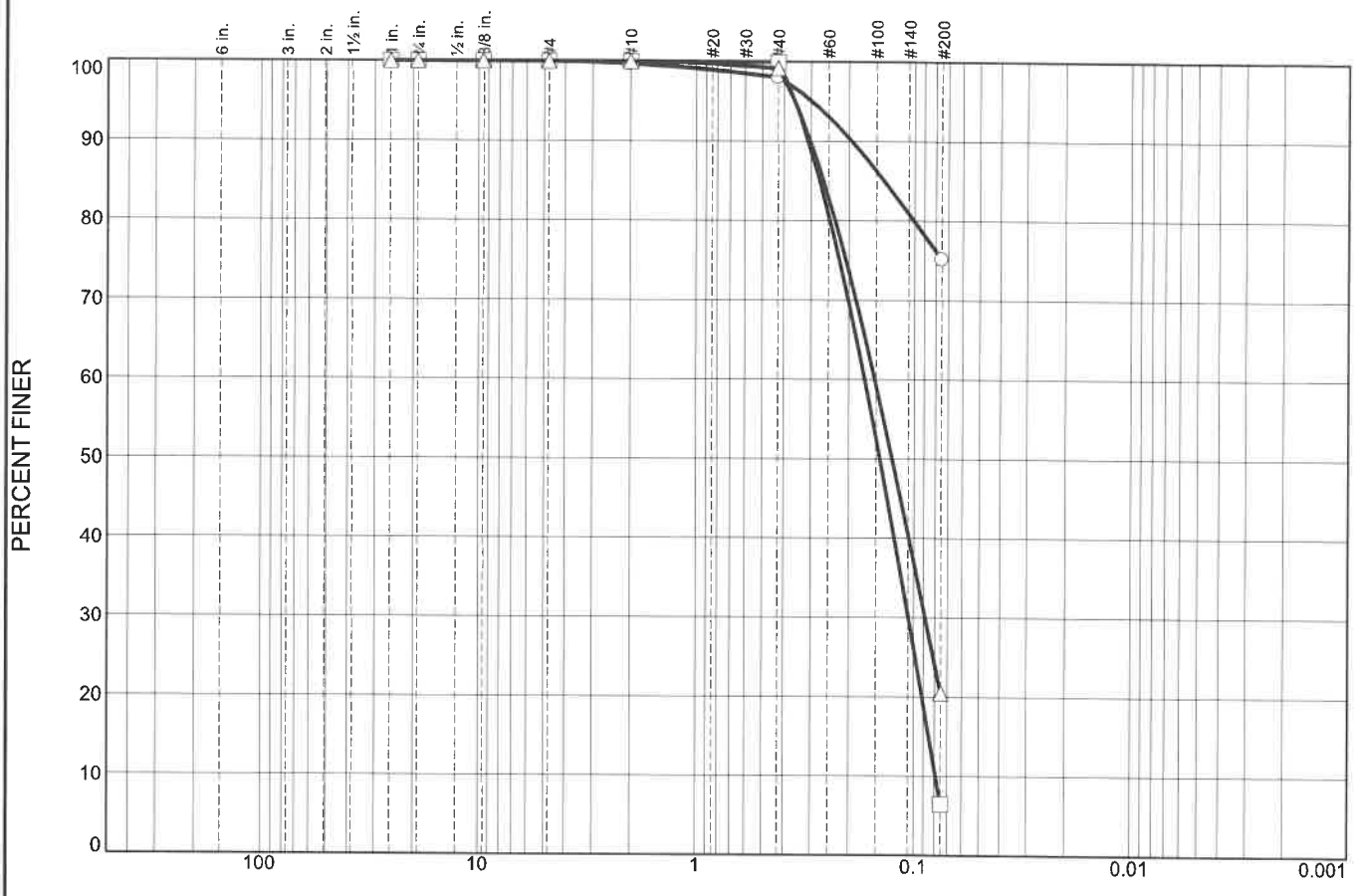
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.3	1.7	22.9	75.1	
□	0.0	0.0	0.0	0.0	0.1	93.4	6.5	
△	0.0	0.0	0.0	0.0	0.8	78.7	20.5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	41	22	0.1381							
□	NV	NP	0.2732	0.1689	0.1433	0.1056	0.0848	0.0789	0.84	2.14
△	NV	NP	0.2625	0.1518	0.1258	0.0884				

	Material Description	USCS	AASHTO
○	GRAY, BROWN SANDY CLAY	CL	A-7-6(14)
□	GRAY SAND	SP-SM	A-3
△	GRAY, BROWN SILTY SAND	SM	A-2-4(0)

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

○ **Source of Sample:** B4 **Depth:** 4

□ **Source of Sample:** B4 **Depth:** 18.5

△ **Source of Sample:** B4 **Depth:** 6

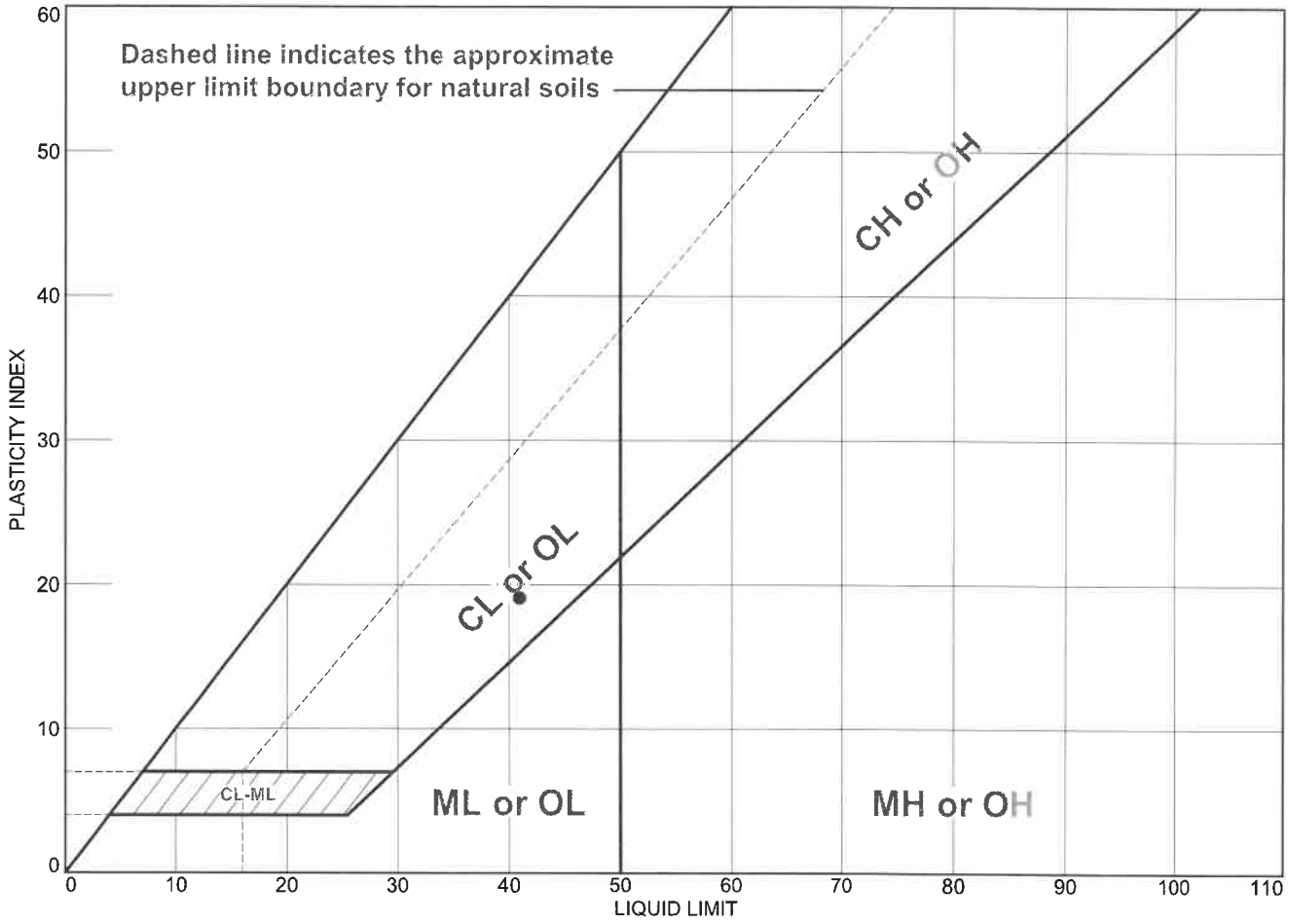
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY, BROWN SANDY CLAY	41	22	19	98.0	75.1	CL
■	GRAY SAND	NV	NP	NP	99.9	6.5	SP-SM
▲	GRAY, BROWN SILTY SAND	NV	NP	NP	99.2	20.5	SM

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B4 **Depth:** 4
■**Source of Sample:** B4 **Depth:** 18.5
▲**Source of Sample:** B4 **Depth:** 6

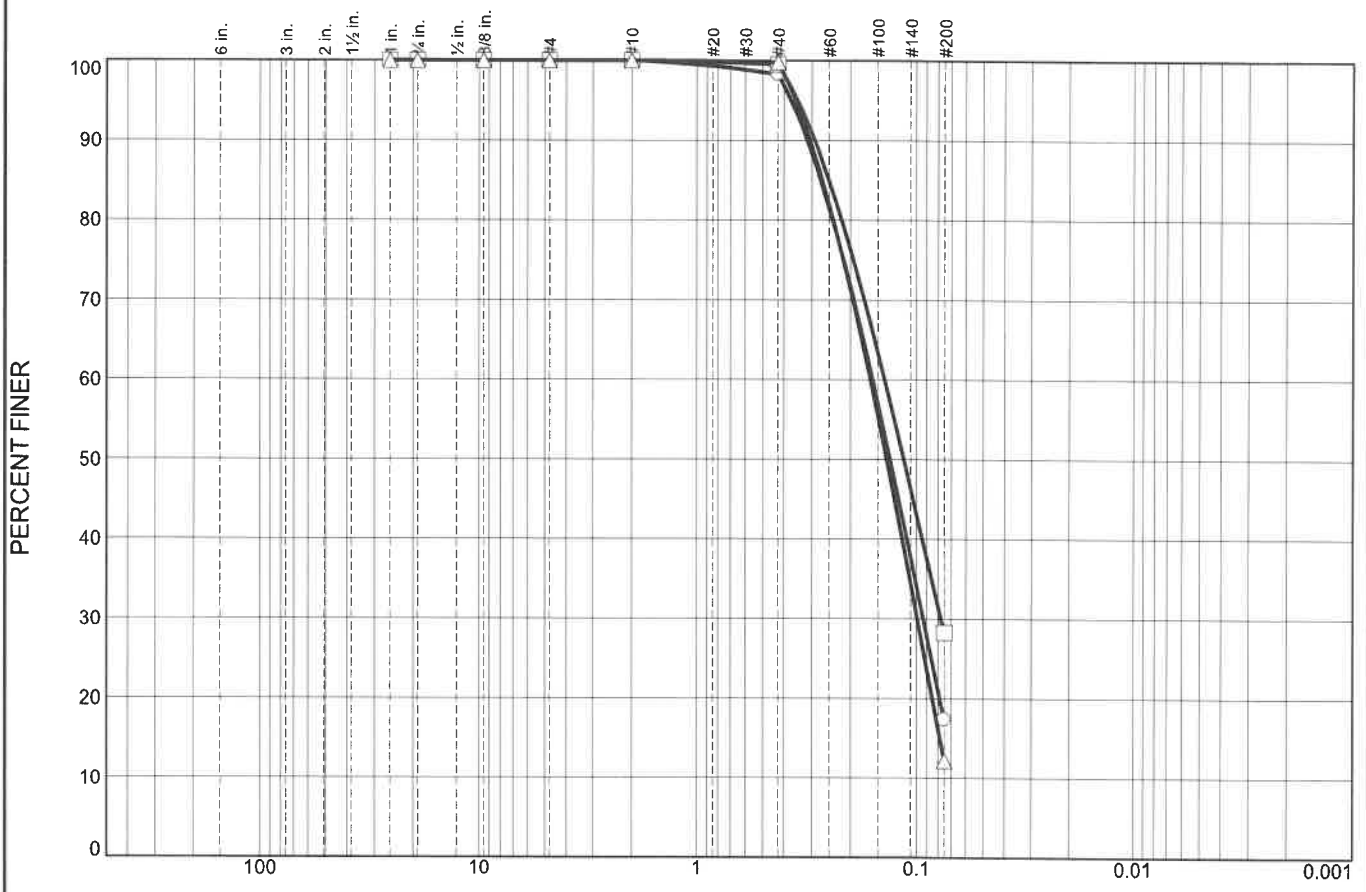
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.7	81.0	17.3	
□	0.0	0.0	0.0	0.0	0.5	71.3	28.2	
△	0.0	0.0	0.0	0.0	0.2	87.6	12.2	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.2726	0.1582	0.1314	0.0929				
□	NV	NP	0.2501	0.1393	0.1139	0.0775				
△	NV	NP	0.2682	0.1620	0.1364	0.0989	0.0784			

	Material Description	USCS	AASHTO
○	BROWN, GRAY SILTY SAND	SM	A-2-4(0)
□	GRAY, BROWN SILTY SAND	SM	A-2-4(0)
△	GRAY, BROWN SILTY SAND	SM	A-2-4(0)

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

○ **Source of Sample:** B5 **Depth:** 2

□ **Source of Sample:** B5 **Depth:** 6

△ **Source of Sample:** B5 **Depth:** 8

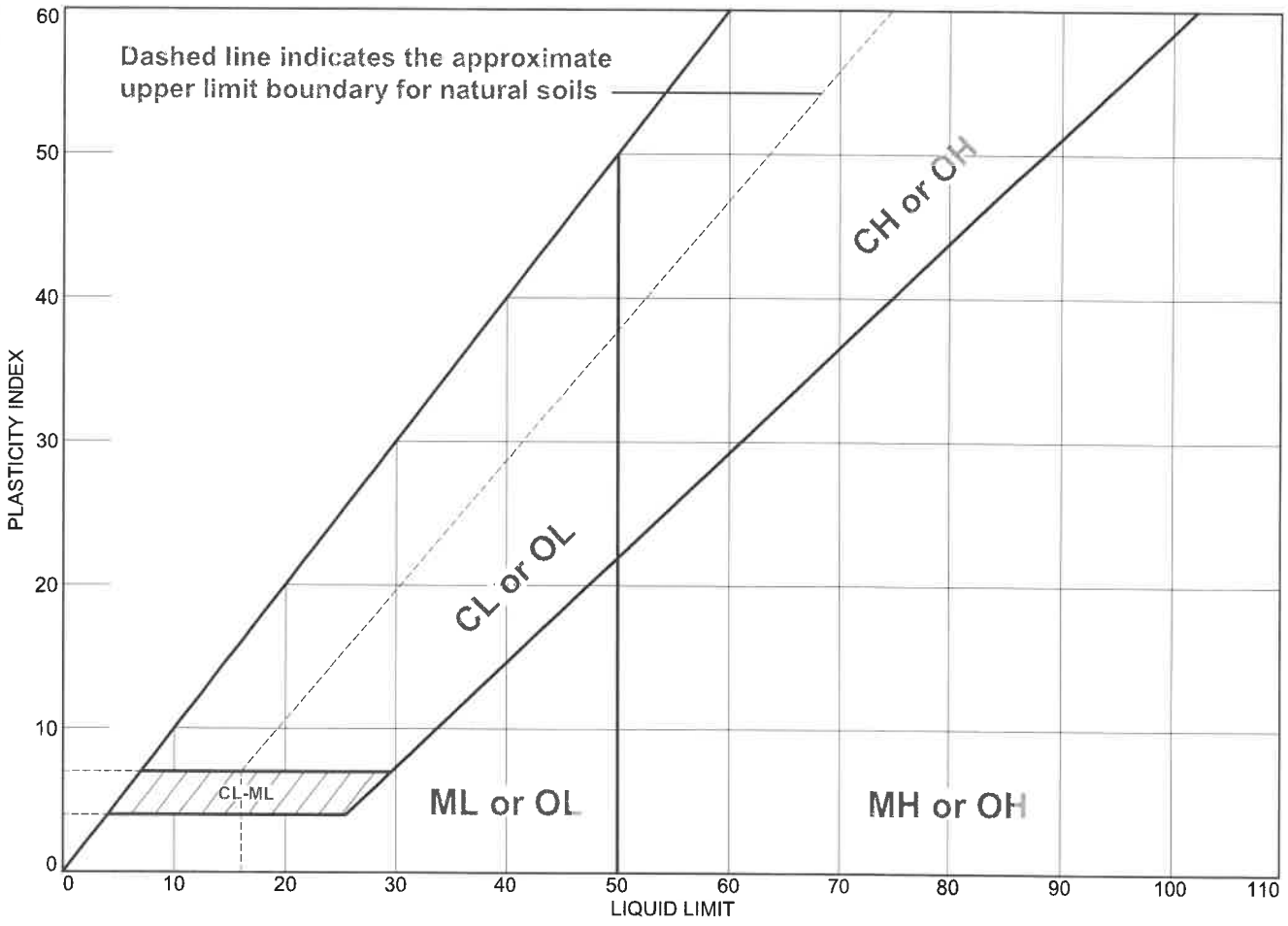
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN, GRAY SILTY SAND	NV	NP	NP	98.3	17.3	SM
■	GRAY, BROWN SILTY SAND	NV	NP	NP	99.5	28.2	SM
▲	GRAY, BROWN SILTY SAND	NV	NP	NP	99.8	12.2	SM

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B5 **Depth:** 2
■**Source of Sample:** B5 **Depth:** 6
▲**Source of Sample:** B5 **Depth:** 8

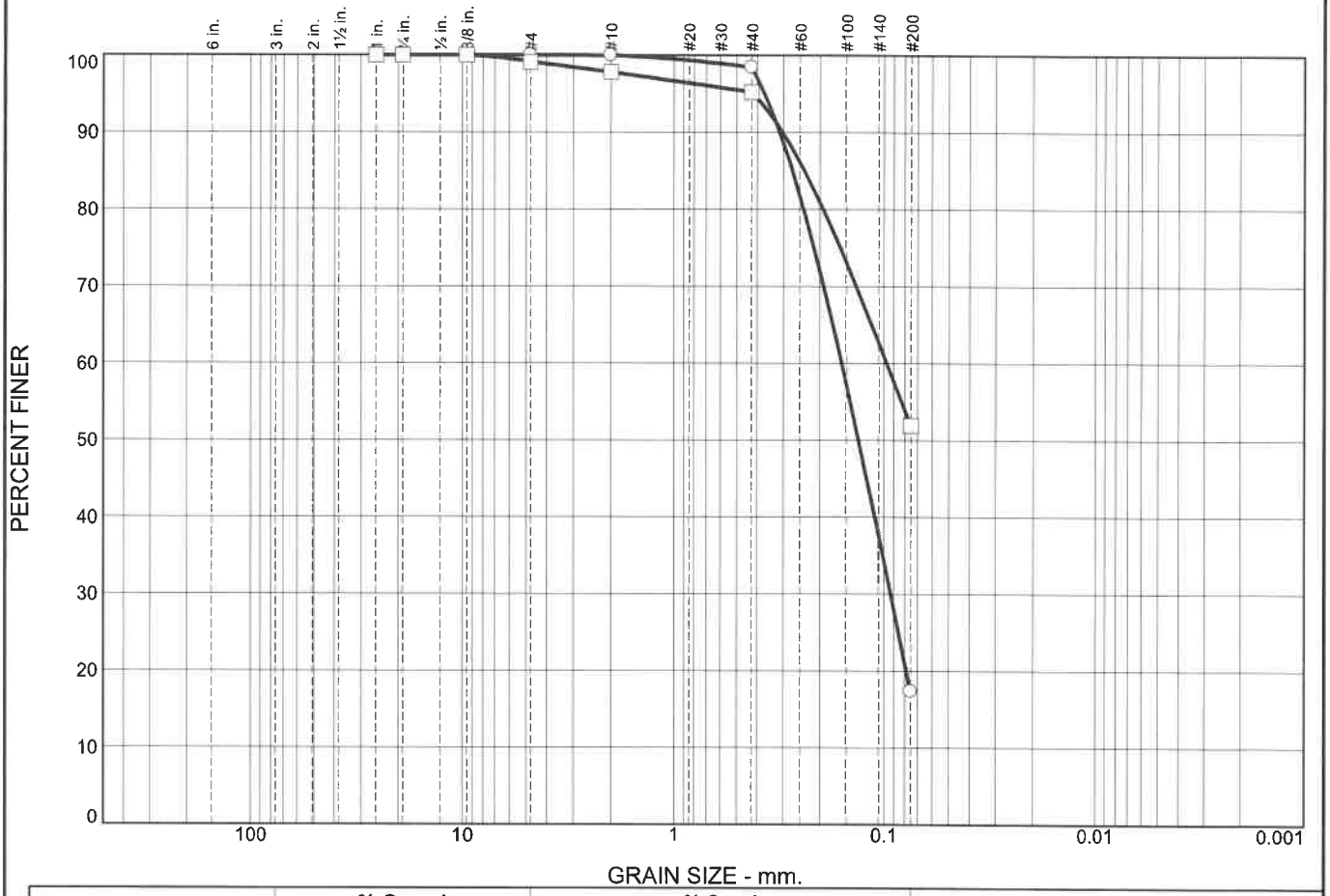
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.6	81.1	17.3	
□	0.0	0.0	0.9	1.3	2.6	43.3	51.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.2713	0.1577	0.1312	0.0928				
□	NV	NP	0.2377	0.0970						

Material Description	USCS	AASHTO
○ BROWN, TAN, GRAY SILTY SAND	SM	A-2-4(0)
□ BROWN, GRAY SANDY SILT	ML	A-4(0)

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

○ **Source of Sample:** B6 **Depth:** 4

□ **Source of Sample:** B6 **Depth:** 0

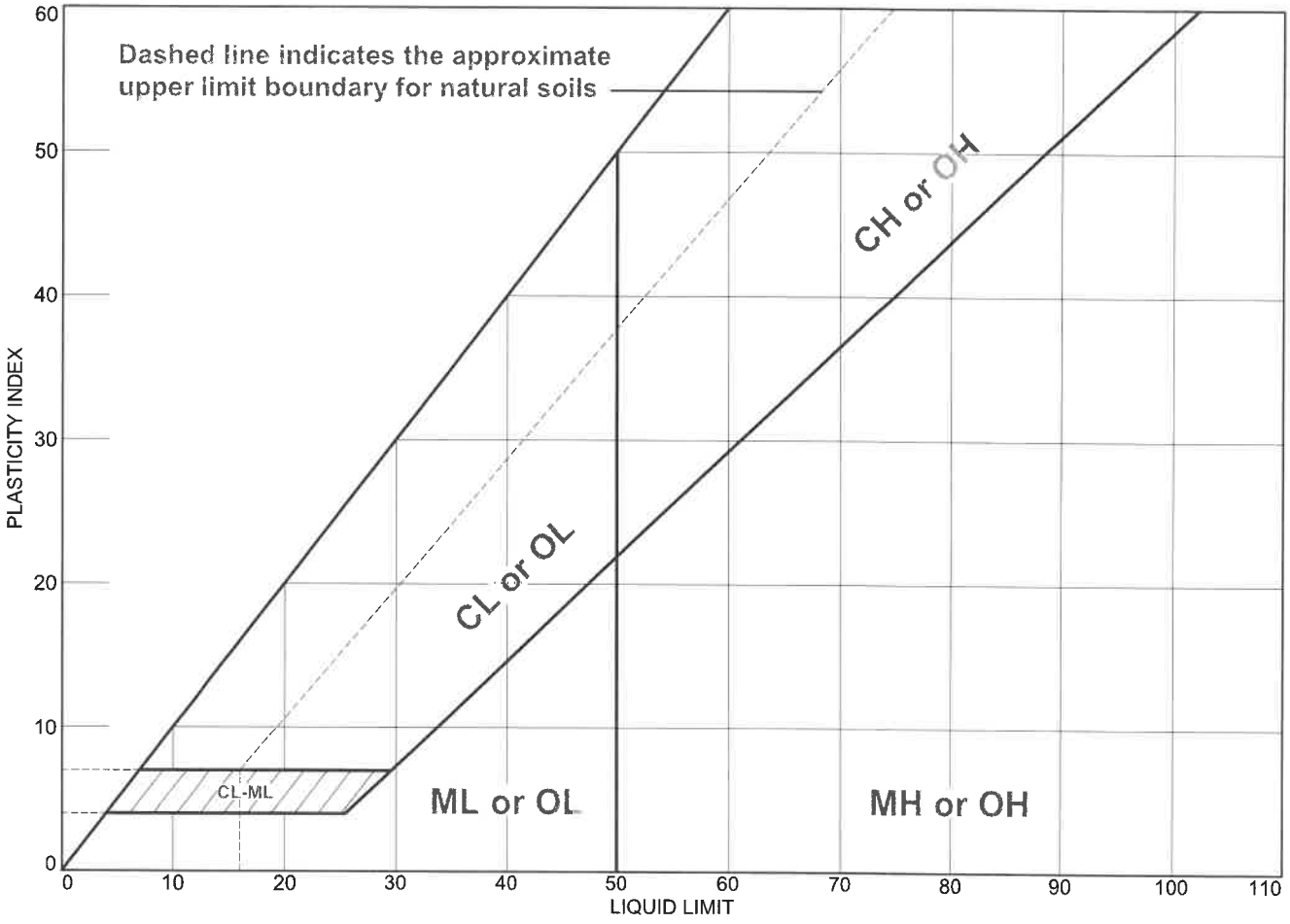
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN, TAN, GRAY SILTY SAND	NV	NP	NP	98.4	17.3	SM
■	BROWN, GRAY SANDY SILT	NV	NP	NP	95.2	51.9	ML

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B6 **Depth:** 4

■**Source of Sample:** B6 **Depth:** 0

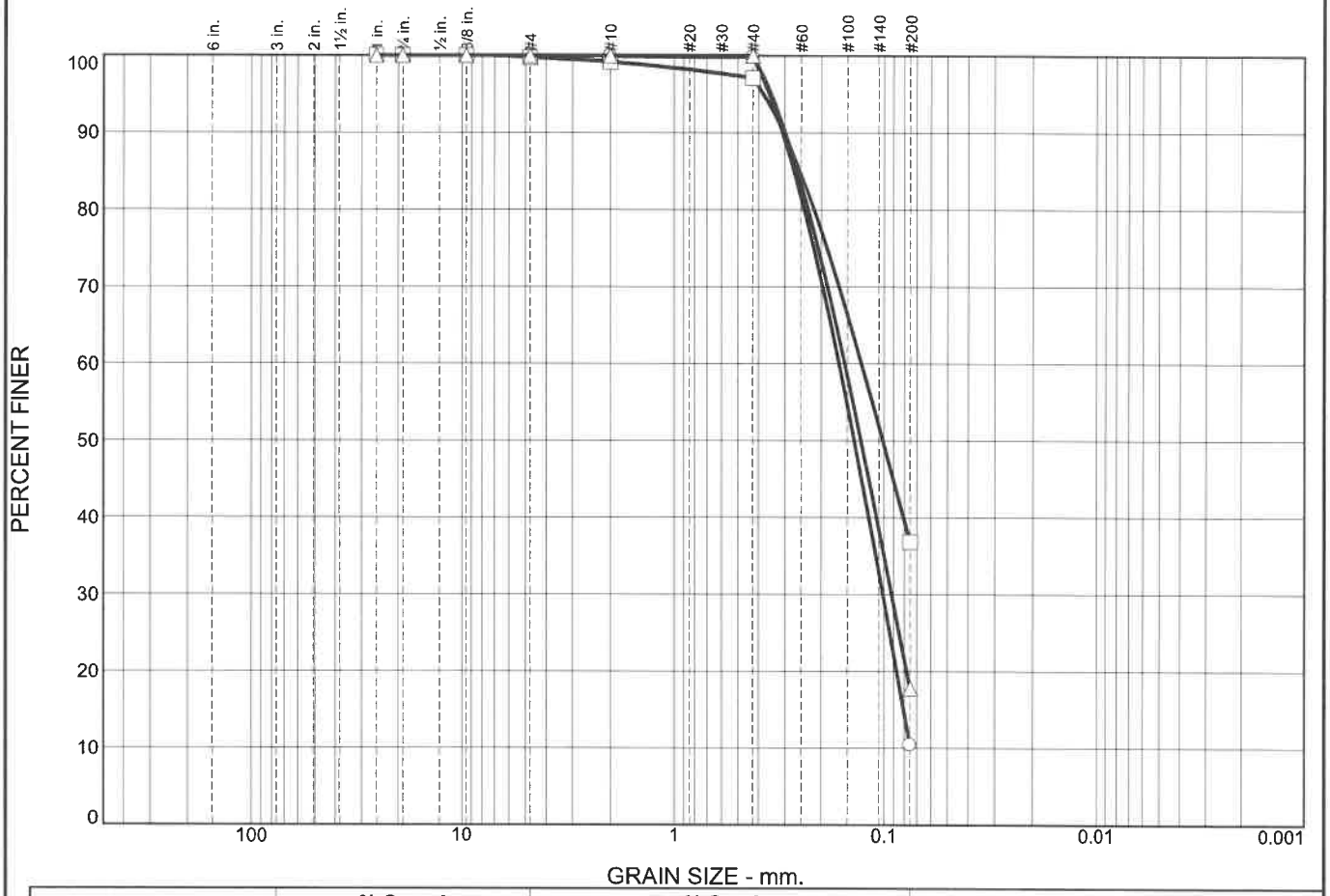
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.1	0.1	89.4	10.4	
□	0.0	0.0	0.3	0.5	2.1	60.2	36.9	
△	0.0	0.0	0.0	0.0	0.0	82.2	17.8	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NV	NP	0.2698	0.1642	0.1386	0.1010	0.0804			
□	18	16	0.2533	0.1279	0.1011					
△	NV	NP	0.2604	0.1540	0.1287	0.0917				

Material Description	USCS	AASHTO
○ TAN, GRAY POORLY GRADED SAND WITH SILT	SP-SM	A-3
□ BROWN SILTY SAND	SM	A-4(0)
△ BROWN, RED SILTY SAND	SM	A-2-4(0)

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

○ **Source of Sample:** B7 **Depth:** 8

□ **Source of Sample:** B7 **Depth:** 2

△ **Source of Sample:** B7 **Depth:** 6

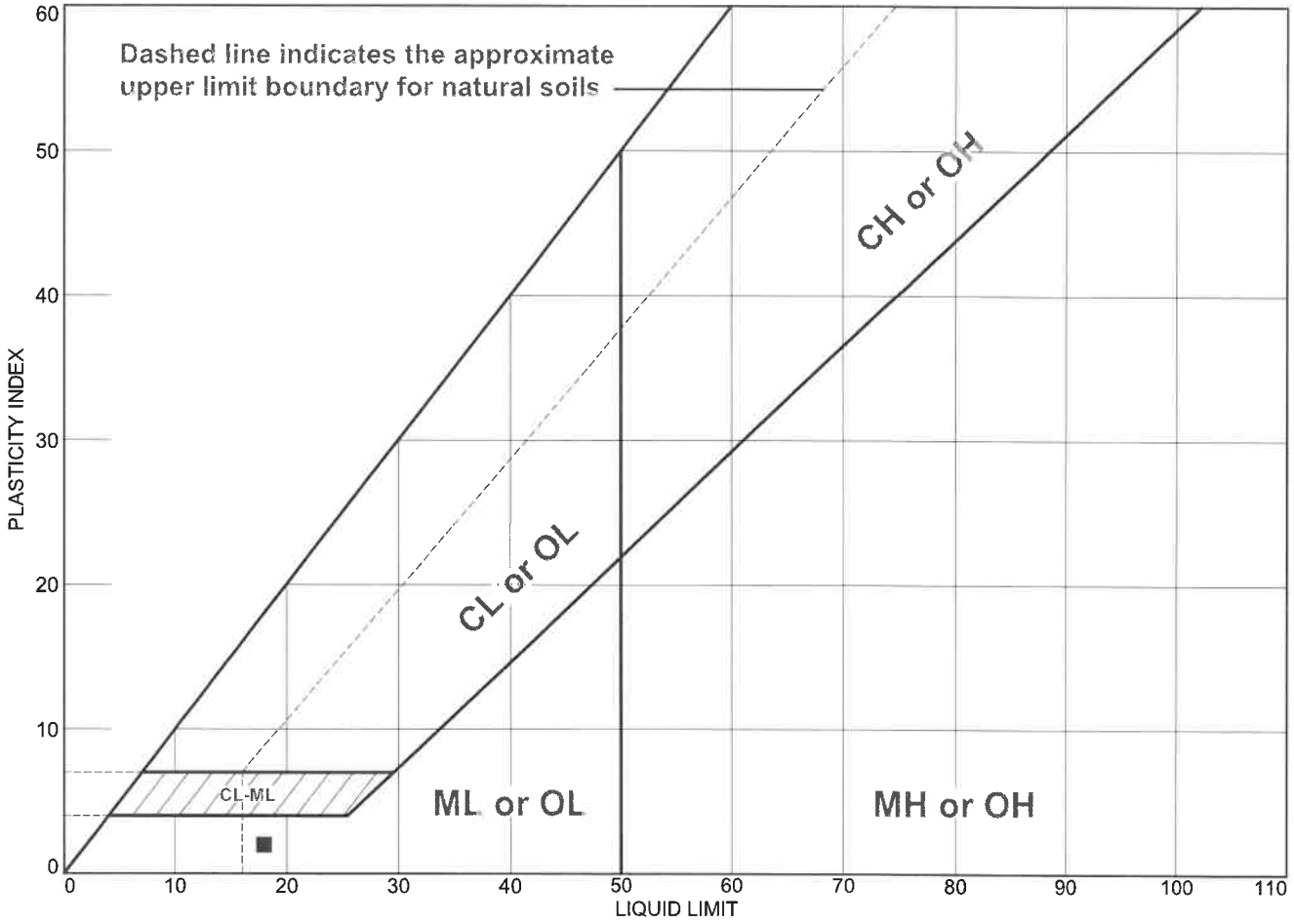
Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	TAN, GRAY POORLY GRADED SAND WITH SILT	NV	NP	NP	99.8	10.4	SP-SM
■	BROWN SILTY SAND	18	16	2	97.1	36.9	SM
▲	BROWN, RED SILTY SAND	NV	NP	NP	100.0	17.8	SM

Project No. 24 105 **Client:**

Project: BLACK RIVER TECHNICAL COLLEGE

●**Source of Sample:** B7 **Depth:** 8

■**Source of Sample:** B7 **Depth:** 2

▲**Source of Sample:** B7 **Depth:** 6

Remarks:

Materials Testing of Arkansas

Little Rock, AR

Figure

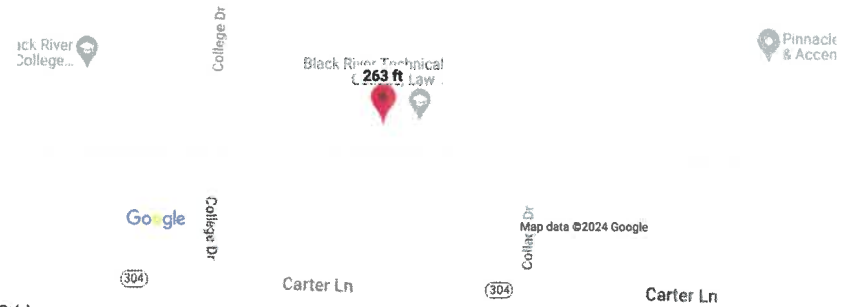
MTA ENGINEERS

Appendix E: Seismic Design Criteria

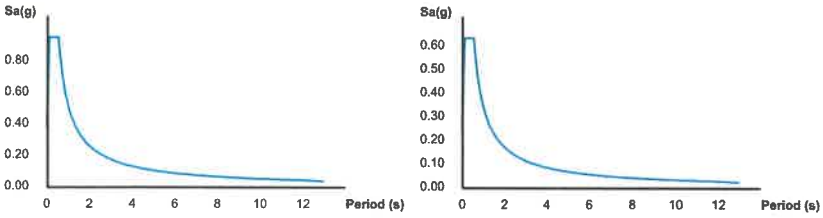
Hazards by Location

Search Information

Coordinates:	36.239151415640876, -90.9484844252701
Elevation:	263 ft
Timestamp:	2024-07-22T18:46:02.608Z
Hazard Type:	Seismic
Reference Document:	IBC-2015
Risk Category:	II
Site Class:	D



MCER Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.81	MCE_R ground motion (period=0.2s)
S_1	0.285	MCE_R ground motion (period=1.0s)
S_{MS}	0.953	Site-modified spectral acceleration value
S_{M1}	0.521	Site-modified spectral acceleration value
S_{DS}	0.635	Numeric seismic design value at 0.2s SA
S_{D1}	0.348	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1.176	Site amplification factor at 0.2s
F_v	1.83	Site amplification factor at 1.0s
CR_S	0.824	Coefficient of risk (0.2s)
CR_1	0.814	Coefficient of risk (1.0s)
PGA	0.451	MCE_G peak ground acceleration
F_{PGA}	1.049	Site amplification factor at PGA
PGA_M	0.473	Site modified peak ground acceleration
T_L	12	Long-period transition period (s)
SsRT	0.81	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.983	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.285	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.35	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.6	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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SECTION 00 4100
BID FORM

THE PROJECT AND THE PARTIES

1.01 TO:

A. Owner: Black River Technical College

1.02 FOR:

A. Law Enforcement Training Academy Barracks

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 DEDUCTIVE ALTERNATIVES

A. Deductive Alternate No. 1 - Deduct the sum of:

_____

(dollar amount to be shown numerically)

1.09 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.

1.10 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 the work (including all punchlist items) by: **December 1, 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.

1.11 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 _____.

1.12 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 ___

1.13 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)

Black River Technical College
1410 Highway 304E
Pocahontas, AR 72455

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

SAMPLE

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

Law Enforcement Training Academy Barracks
Black River Technical College
Pocahontas, 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.

Init.
/
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User Notes:
(1749381967)

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

SAMPLE

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.)

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[ ] 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

SAMPLE

§ 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.)

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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.

SAMPLE

§ 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.)

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§ 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.

SAMPLE

§ 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.)

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§ 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.)

SAMPLE

§ 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)

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§ 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:

SAMPLE

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.)

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[ ] 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.)

SAMPLE

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)*

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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#:** **2405**	Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, 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:	Black River Technical College 1410 Highway 304E Pocahontas, AR 72455	**PROJECT:**	Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, Arkansas	**APPLICATION NO:** 001 **PERIOD TO:**	**Distribution to:** OWNER: ☐
FROM CONTRACTOR:		**VIA ARCHITECT:**	Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401	**CONTRACT FOR:** General Construction **CONTRACT DATE:** **PROJECT NOS:** 2405 / /	ARCHITECT: ☐ CONTRACTOR: ☐ FIELD: ☐ OTHER : ☐

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.

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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: 2405

A	B	C	D	E	F	G		H	I
ITEM NO.	DESCRIPTION OF WORK	SCHEDULED VALUE	WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)	WORK COMPLETED 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
		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**

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AIA® Document G701® – 2017

Change Order

PROJECT: *(Name and address)*	CONTRACT INFORMATION:	CHANGE ORDER INFORMATION:
Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, Arkansas	Contract For: General Construction Date:	Change Order Number: 001 Date:
OWNER: *(Name and address)* Black River Technical College 1410 Highway 304E Pocahontas, AR 72455	**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.

ARCHITECT *(Firm name)*	CONTRACTOR *(Firm name)*	OWNER *(Firm name)*
Brackett Krennerich & Associates, P.A.		Black River Technical College
SIGNATURE	**SIGNATURE**	**SIGNATURE**
Todd Welch, AIA, Vice President		
PRINTED NAME AND TITLE	**PRINTED NAME AND TITLE**	**PRINTED NAME AND TITLE**
DATE	**DATE**	**DATE**

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AIA® Document G704® – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)*	CONTRACT INFORMATION:	CERTIFICATE INFORMATION:
Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, Arkansas	Contract For: General Construction Date:	Certificate Number: 001 Date:

OWNER: *(name and address)*	ARCHITECT: *(name and address)*	CONTRACTOR: *(name and address)*
Black River Technical College 1410 Highway 304E Pocahontas, AR 72455	Brackett Krennerich & Associates, P.A. 100 E. Huntington Ave., Suite D Jonesboro, AR 72401	

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)* Black River Technical College	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE**
OWNER *(Firm Name)*	**SIGNATURE**	**PRINTED NAME AND TITLE**	**DATE**

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AIA® Document G706® – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)* Law Enforcement Training Academy Black River Technical College Pocahontas, Arkansas	**ARCHITECT'S PROJECT NUMBER:** 2405 **CONTRACT FOR:** General Construction **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐
TO OWNER: *(Name and address)* Black River Technical College 1410 Highway 304E Pocahontas, AR 72455		

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:

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Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)* Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, Arkansas **TO OWNER:** *(Name and address)* Black River Technical College 1410 Highway 304E Pocahontas, AR 72455	**ARCHITECT'S PROJECT NUMBER:** 2405 **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:

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AIA® Document G707™ – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)* Law Enforcement Training Academy Barracks Black River Technical College Pocahontas, Arkansas	**ARCHITECT'S PROJECT NUMBER:** 2405 **CONTRACT FOR:** General Construction **CONTRACT DATED:**	OWNER: ☐ ARCHITECT: ☐ CONTRACTOR: ☐ SURETY: ☐ OTHER: ☐
TO OWNER: *(Name and address)* Black River Technical College 1410 Highway 304E Pocahontas, AR 72455		

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)

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BRACKETT KRENNERICH architects

SUBSTITUTION REQUEST FORM

To: _____ Commission Number: _____

_____ Date Received: _____

Project: _____

_____

_____

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)

Law Enforcement Training Academy Barracks
Black River Technical College
Pocahontas, Arkansas

THE OWNER:
(Name, legal status and address)

Black River Technical College
1410 Highway 304E
Pocahontas, AR 72455

THE ARCHITECT:
(Name, legal status and address)

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

TABLE OF ARTICLES

1 GENERAL PROVISIONS

2 OWNER

3 CONTRACTOR

4 ARCHITECT

5 SUBCONTRACTORS

6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

7 CHANGES IN THE WORK

8 TIME

9 PAYMENTS AND COMPLETION

10 PROTECTION OF PERSONS AND PROPERTY

11 INSURANCE AND BONDS

12 UNCOVERING AND CORRECTION OF WORK

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.

Init.
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13 MISCELLANEOUS PROVISIONS

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
Access to Work
3.16, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
Administration of the Contract
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
Allowances
3.8
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
Award of Subcontracts and Other Contracts for Portions of the Work
5.2
Basic Definitions
1.1
Bidding Requirements
1.1.1
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
Capitalization
1.3
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5

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Certificates for Payment
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4
Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
CLAIMS AND DISPUTES
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
Claims for Additional Cost
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
Cleaning Up
3.15, 6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
Consolidation or Joinder
15.4.4
CONSTRUCTION BY OWNER OR BY
SEPARATE CONTRACTORS
1.1.4, **6**
Construction Change Directive, Definition of
7.3.1
Construction Change Directives
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules, Contractor's
3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **14**
Contract Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2

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Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
Contractor's Liability Insurance
11.1
Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents
3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract
14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent
3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications
1.5, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
Cutting and Patching
3.14, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
Date of Commencement of the Work, Definition of
8.1.2
Date of Substantial Completion, Definition of
8.1.3
Day, Definition of
8.1.4
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2
Decisions to Withhold Certification
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
Delays and Extensions of Time
3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
Disputes
6.3, 7.3.9, 15.1, 15.2
Documents and Samples at the Site
3.11
Drawings, Definition of
1.1.5
Drawings and Specifications, Use and Ownership of
3.11
Effective Date of Insurance
8.2.2
Emergencies
10.4, 14.1.1.2, **15.1.5**
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

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Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work)
Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
Judgment on Final Award
15.4.2
Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

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MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.5, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1
Performance Bond and Payment Bond
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
Polychlorinated Biphenyl
10.3.1
Product Data, Definition of
3.12.2
Product Data and Samples, Shop Drawings
3.11, **3.12**, 4.2.7
Progress and Completion
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

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Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
Review of Contract Documents and Field Conditions by Contractor
3.2, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2
Review of Shop Drawings, Product Data and Samples by Contractor
3.12
Rights and Remedies
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2, 12.2.4, **13.3**, 14, 15.4
Royalties, Patents and Copyrights
3.17
Rules and Notices for Arbitration
15.4.1
Safety of Persons and Property
10.2, 10.4
Safety Precautions and Programs
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
Samples, Definition of
3.12.3
Samples, Shop Drawings, Product Data and
3.11, **3.12**, 4.2.7
Samples at the Site, Documents and
3.11
Schedule of Values
9.2, 9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
Separate Contractors, Definition of
6.1.1
Shop Drawings, Definition of
3.12.1
Shop Drawings, Product Data and Samples
3.11, **3.12**, 4.2.7
Site, Use of
3.13, 6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
Subcontractor, Definition of
5.1.1
SUBCONTRACTORS
5
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7
Subcontractual Relations
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
Substantial Completion
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
Substitutions of Materials
3.4.2, 3.5, 7.3.8
Sub-subcontractor, Definition of
5.1.2

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Subsurface Conditions
3.7.4
Successors and Assigns
13.2
Superintendent
3.9, 10.2.6
Supervision and Construction Procedures
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
TIME
8
Time, Delays and Extensions of
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
UNCOVERING AND CORRECTION OF WORK
12
Uncovering of Work
12.1
Unforeseen Conditions, Concealed or Unknown
3.7.4, 8.3.1, 10.3
Unit Prices
7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
Use of Site
3.13, 6.1.1, 6.2.1
Values, Schedule of
9.2, 9.3.1
Waiver of Claims by the Architect
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
Work, Definition of
1.1.3
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

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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.

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§ 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.

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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.

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§ 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

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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.

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§ 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.

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§ 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.

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§ 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,

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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,

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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

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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.

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§ 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.

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§ 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.

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§ 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;

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.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.

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§ 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.

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§ 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;

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.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.

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§ 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.

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§ 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;

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.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

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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

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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

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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.

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§ 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

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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.

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§ 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.

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§ 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.

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§ 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.

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§ 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.

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§ 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.

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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 / Sound System / Speakers
   4. Video Projectors
   5. Access control for door hardware
   6. Television Monitors and Supports
   7. Phone System
   8. Data Server
   9. 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
   10. Window Treatments (blinds, curtains, etc.)
   11. Interior Room Signage

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.

B. Section 31 2323: Include the potential undercut of **900 cubic yards** of soil. This price is to be included in the base bid.

C. Include in the bid **$10,000** for exterior building signage.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2200
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

C. Defect assessment and non-payment for rejected work.

1.02 RELATED REQUIREMENTS

A. Section 00 4100 – Bid Form

B. Section 01 2100 – Allowances

C. Section 31 1000 - Site Clearing

D. Section 31 2200 Grading

E. Section 31 2316 Excavation

F. Section 31 2323 Fill

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead, profit, and taxes.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Take all measurements and compute quantities. Measurements and quantities will be verified by the independent testing agency retained by the construction manager to provide soil testing services.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

E. Stipulated Sum/Price Measurement: Items measured by volume as a completed item or unit of the Work.

F. Perform surveys required to determine quantities, including control surveys to establish measurement reference lines. Notify Architect prior to starting work.

G. Engineer's Responsibilities: Sign surveyor's field notes or keep duplicate field notes ,calculate and certify quantities for payment purposes.

1.06 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work which is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit sum/price.

B. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.

4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected Products.

1.07 DEFECT ASSESSMENT

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

B. The authority of Architect to assess the defect and identify payment adjustment is final.

1.08 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1 - Undercut and Replacement of Soils. Refer to Section 31 2323 – Fill.
   1. As referred to by Specification Section 00 31 00 - Geotechnical Report, upper weak soils will be undercut and backfilled as needed. For bidding purposes a pre-calculated cubic yardage amount is to be included in the base bid as provided in Section 01 21 00 - Allowances, Allowance B.
   2. Undercut and Replacement of Soft Soils. Unit price shall apply in the event additions to or deductions from the work are required and authorized by the Architect. Quote cubic yard price for undercut, removal, backfill and compaction with select fill below building and paved areas where soft soil is encountered. Quantities measured in place by cross-sectioned area. Unit price to include all costs including cost of removal and replacement of materials, state sales tax, placing costs, all insurance costs, payroll taxes, overhead and profit and allowable bond premium.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300

DEDUCTIVE ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of alternate bids required.

1.02 RELATED SECTIONS

A. Division 00 4100 - Bid Form

B. Section 32 1123 – Aggregate Base Courses

C. Section 32 1216 – Asphalt Paving

D. Section 32 1313 – Concrete Paving

E. Section 32 1713 – Parking Bumpers

F. Section 32 1723.13 – Painted Pavement Markings

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ALTERNATE BIDS

A. Deductive Alternate No. 1
   1. Provide all material, labor, and associated expenses to omit parking lot (clouded as Deductive Alternate No. 1) shown on Sheet C002. Omit asphalt, curb and gutter, concrete ADA parking, parking bumpers, handicap signs, painted pavement marking, sidewalks, and aggregate base course within clouded boundary.

3.02 BID INCLUSION

A. Included deductive pricing as shown on the bid form. Deduction pricing to include all applicable taxes, etc. and include items necessary to make the deduction and totally complete the requested change.

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.

C. **Provide and maintain protective egress at all entrances/exits affected by construction.**

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 5710
EXCAVATION SAFETY PROCEDURES

PART 1 GENERAL

1.01 SCOPE

A. In accordance with Arkansas Code Annotated 22-9-212, the contractor shall include a separate pay item for trench or excavation safety systems for any trench or excavation which equals or exceeds five (5) feet in depth and this pay item shall be a part of the contract price.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials used must meet OSHA regulations.

PART 3 EXECUTION

3.01 METHODOLOGY

A. It is the contractor's responsibility to comply with regulations for excavation safety systems.

B. The Occupational Safety and Health Administration (OSHA) Standard for Excavation and Trenches Safety System 29 CFR 1926, Subpart P applies to this project in the event that any excavation is 5 feet or greater.

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 equal to or 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. Drawing included in contract documents for the Storm Water Pollution Prevention Plan prepared by Associated Engineers and Testing, LLC, 103 S Church Street, Jonesboro, Arkansas, 72401.

B. See Storm Water Pollution Plan included at the end of this section.

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

SITE WITH AUTOMATIC COVERAGE (LESS THAN 5 ACRES) CONSTRUCTION SITE NOTICE

FOR THE
Division of Environmental Quality (DEQ)
Stormwater Program

NPDES GENERAL PERMIT NO. ARR150000

The following information is posted in compliance with **Part I.B.8.a** of the DEQ General Permit Number **ARR150000** for discharges of stormwater runoff from sites with automatic coverage. Additional information regarding the DEQ stormwater program may be found on the internet at:
www.adeq.state.ar.us/water/branch_npdes/stormwater

Permit Number	ARR150000
Contact Name: Phone Number:	_____ _____
Project Description (Name, Location, etc.): Start Date: End Date: Total Acres:	_____ _____ _____ _____
Location of Stormwater Pollution Prevention Plan:	_____

Does this construction activity take place, and does the stormwater discharge occur within the drainage area addressed by a TMDL?

_____YES _____NO

For Construction Sites Authorized under **Part I.B.6.a** (Automatic Coverage) the following certification must be completed:

I _____ (Typed or Printed Name of Person Completing this Certification) certify under penalty of law that I have read and understand the eligibility requirements for claiming an authorization under Part I.B.2. of the DEQ General Permit Number ARR150000. A stormwater pollution prevention plan has been developed and implemented according to the requirements contained in Part II.A.2.B & D of the permit. I am aware there are significant penalties for providing false information or for conducted unauthorized discharges, including the possibility of fine and imprisonment for knowing violations.

_____ Signature and Title

_____ Date

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

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 grade shown to be removed on site demolition plan.

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.

D. Removal of existing building components as described on the drawings.

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. Elevated concrete slabs.

C. Floors and slabs on grade.

D. Concrete foundation walls.

E Concrete reinforcement.

F. Joint devices associated with concrete work.

G. Miscellaneous concrete elements, including equipment pads, light pole bases, drainage structures.

H. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 01 2200 - Unit Prices.

B. Section 01 4000 - Quality Requirements, for testing.

C. Section 03 3515 – Diamond Polished Concrete.

D. Section 07 2600 - Vapor Barrier for under slabs on grade.

E. Section 07 9005 - Joint Sealers.

F. Section 31 2323 - Drainage fill under slabs-on-grade.

G. 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.

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.

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.
   3. Do not use Dobies blocks to support wire mesh in slab reinforcement.

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 Barrier: 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"
   7. NOTE: Curing compound will not be permitted in areas where floors are to be polished.

G. Concrete Sealer:
   1. Scofield Selectseal-Plus
   2. Or approved equal
   3. NOTE: Concrete Sealer will not be permitted in areas where floors are to be polished.

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 barrier 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, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

E. Repair underslab vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier 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. 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.

P. 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. Floors to receive polished finish:
      a. F(F): Specified Overall Value (SOV) of 50; Minimum Localized Value (MLV) of 30.
      b. F(L): Specified Overall Value (SOV) of 35; Minimum Localized Value (MLV) of 20.
   2. All other 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.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal or as indicated on drawings.

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

E. Stair Landings and Stair Treads: Proportion normal weight concrete mix as follows:
   1. Compressive strength (28 days): 3000 psi
   2. Slump Range: 5 to 7 inches

END OF SECTION

SECTION 03 3515

DIAMOND POLISHED CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Polished Concrete Finishing

1.02 RELATED SECTIONS

A. Section 03 3000 – Cast-In-Place Concrete.

1.03 REFERENCE

A. ASTM C779, Standard Test Method for Abrasion of Horizontal Concrete Surfaces.

B. ASTM C805, Impact Strength.

C. ASTM G23-81, Ultraviolet Light & Water Spray.

D. ASTM 1028, co-efficient of Friction.

E. ASTM C 150, Type I, II Portland cement conformity, depending on soil conditions.

F. ASTM C 33, Aggregate conformity.

1.04 SUBMITTALS

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

B. Product data for each grinding machine, including all types of grinding heads, dust extraction system, joint filler, concrete densifying impregnator, penetrating sealer, and any other chemicals used in the process.

C. Applicators qualification data.

D. Polished concrete samples: size 12" x 12" for each Polished Concrete finish required

1.05 QUALITY ASSURANCE

A. Application Qualifications: Company regularly engaged in satisfactory installation of similar materials. Provide a list of five (5) projects of similar nature and complexity completed in the last two (2) years.

B. Single Source Responsibility: Provide required materials, complete, produced by the same manufacturer. All prospective installers must provide a statement of certification from the manufacturer.

C. Mock-Up

1. General Contractor to notify applicator 7 days prior to schedule finish of mock-up.

2. Reserve 1 square foot for each color and finish at location adjacent to floor that will receive polish, but will be covered with another flooring material. Mock-up floor shall be placed on the same day, preferably the same pour as the floors to receive polish.

3. Install mock-ups to verify selections made under sample submittal and to demonstrate methods and workmanship proposed for the project. If mock-up not possible, submitted samples will be accepted as demonstrated methods & workmanship.

4. Aggregate selected must be tested to ensure it will accept polish.

5. If stand alone mock-up required, form should be clean and free from extraneous substance and be at least a 12' x 12' with a level plywood bottom on level ground with

unobstructed access around all four sides.

6. control joints should be included in mock-up. Sawing performed by General Contractor can begin as soon as the surface is firm enough not to displace any of the aggregate.
7. Edges should be included in mock-up.
8. Approved mock-ups may become part of the completed work if undisturbed at time of substantial completion.

D. Protection: General Contractor shall protect areas to receive polished concrete finish at all times during construction to prevent oils, dirt, metal, excessive water and other potentially damaging materials from affecting the finished concrete surface. Protection measures listed below shall begin immediately after the concrete slab is poured:

1. All hydraulic powered equipment shall be diapered to avoid staining of the concrete.
2. All vehicle parking shall be prohibited on the finish slab area. If necessary to complete their scope of work, drop cloths shall be placed under vehicles at all times.
3. No pipe cutting machine shall be used on the finish floor slab.
4. Steel shall not be placed on the finish slab to avoid rusting.
5. Acids and acidic detergents will not come in contact with slab.
6. All painters will use drip cloths on the concrete. If paint gets on the concrete, it must be immediately removed.
7. All trades will be informed that the slab must be protected at all times.

E. Environmental Limitations:

1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation and other conditions affecting chemical performance.
2. Flatness and levelness
   a. Finish Concrete shall have aminimum Floor Flatness rating of at least 40.
   b. Finish Concrete shall have a minimum Floor Levelness rating of at least 30.
   c. Finish Concrete shall be cured a minimum of 28 days or at which point equipment can be put on the slab and does not displace aggregate.
3. Application of finish system shall take place a minimum of 21 days prior to fixture & trim installation and/or substantial completion.
4. Finish Concrete area shall be closed to traffic during finish floor application and after application, for the time as recommended by manufacturer.

1.06 PRE INSTALLATION MEETING

A. Convene one week before starting work in this section.

1.07 WARRANTY

A. Furnish a written warranty covering both material & workmanship for a period of 10 years from date of installation.

PART 2 PRODUCTS

2.01 APPROVED MANUFACTURERS

A. HTC Superfloor, Manufactured by HTC LLC. www.htc-america.com.

B. Amerishine Concrete Polishing System, www.acci-us.com.

C. SASE Diamatic System, www.sadecompany.com.

D. Or Approved Equal.

2.02 POLISHING MATERIAL

A. Three-phase 480 volt generator and step down transformer.

B. 3 head counter rotating variable speed HTC Superfloor Approved Floor Grinder with at least 600 pounds down pressure. For example: HTC 950RX, HTC 800HDX, HTC 800 HD, HTC 650HDX, etc.

C HTC Superfloor dust extraction system, pre-separator, and squeegee attachments with inimum flow rating of 322 cubic feet per minute such as the HTC 75D.

D. Grinding Heads:

1. HTC Superfloor Metal bonded 25, 80, 150.
2. HTC Superfloor Resin bonded, phenolic diamonds, 100, 200, 400, 800, 1500 and 3000 grits.

E. Hand Grinder with dust extraction attachment and pads.

F. Penetrating Liquid Sealer Hardener Densifying Impregnator with the following performance criteria: chemically reactive, waterborne solution of inorganic sodium silicate materials and proprietary components; odorless, colorless which hardens and densifies concrete surfaces to protect against abrasion, dusting, and absorption of liquids. Retroplate 99 shall be acceptable.

G. Control Joint and Saw cut Filler, two part filler or polyurea.

H. A ready to use, penetrating, dye or reactive stain that chemically combines with cured concrete to produce permanent, variegated or translucent color effects or a hydrolyzed, lithium quartz or siliceous materials to create a translucent or marbled color effects. Ameripolish Decorative acetone dye shall be acceptable

PART 3 EXECUTION

3.01 PREPARATION

A. Installer shall examine and approve concrete substrate for conditions affecting performance of finish. General Contractor shall correct conditions that are found to be out of compliance with the requirements of this section. Repairs are not acceptable unless specifically approved on a case-by-case basis by the Architect.

B. Verify that base slab meet finish and surface profile requirements listed in Section 03 3000 “Cast-in-Place Concrete”.

C. Provide floor clean of materials and debris.

D Protect adjacent surfaces as required to prevent damage by the concrete polishing procedure.

E. Setup grinding machine, dust extraction system, tooling, and generator.

F. Ensure floor cured to accept polishing application.

3.02 POLISHIED CONCRETE APPLICATION

A. Applicator shall examine the areas and conditions under which work of this section will be

provided and the General Contractor shall correct conditions detrimental to the timely and proper completion of the work and the Applicator shall not proceed until unsatisfactory conditions are resolved.

B. Grind the concrete floor with 25, 80 and 150 grit removing construction debris, floor slab imperfections and until there is a uniform scratch pattern and desired concrete aggregate exposure is achieved. Vacuum the floor thoroughly using a squeegee vacuum attachment.

C. Apply material approved by architect for color effects in accordance with the architectural drawings and the manufacturers recommended guidelines.

D. Fill construction joints and cracks with filler products as specified in accordance with manufacturers instructions colored to contrast with concrete color as specified by architect.

E. Appy **Retroplate 99** densifying impregnator undiluted at approximately 200 square feet per gallon using a stiff, long bristled broom. Cover the entire work area liberally and allow to sit for 10 minutes. Apply again to areas where the densifying impregnator has soaked in and allow to sit for an additional 30 minutes. Squeegee excess material off the floor. Allow 12 to 24 hours for full cure.

F. Grind the floor with metal bonded diamond grits of 150, grinding 90 degrees from each previous grind and removing all the scratches from the previous grit. Vacuum the floor thoroughly after each grind, using a squeegee vacuum attachment.

G. Polish the floor, to desired sheen level, with phenolic resin bonded diamond grits of 100, 200, 400, 800, 1500 and 3000. After each polish, clean the floor thoroughly using clean water and an autoscrubber or a mop and a wet vacuum.

H. Apply HTC Superfloor Stainguard with micro mop and buff with high speed burnisher, as needed to eliminate streaking.

I. Upon completion, the work shall be ready for final inspection and acceptance by the customer.

3.03 PROTECTION

A. Protect the floors from damage until substantial completion.

3.04 SCHEDULES

A. Finishing equal to HTC Superfloor "Bronze" Finish.

1. As indicated on finish schedule.

END OF SECTION

SECTION 03 4843
PRECAST ARCHITECTURAL CONCRETE

PART I—GENERAL

1.01 SECTION INCLUDES

A. Precast Concrete at Column Caps

B. Precast Concrete at Exterior window sills

C. Support, Anchors, Attachement

D. Intermediate and Perimeter Joint Sealant

1.02 RELATED SECTIONS

A. Section 04 0511, Masonry Mortaring and Grouting

B. Section 04 2000, Unit Masonry

C. Section 07 1900, Water Repellents for Masonry Sealer

1.03 REFERENCE STANDARDS

A. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2002.

B. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for concrete.

C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2004b.

D. ASTM C 33 - Standard Specification for Concrete Aggregates; 2003.

E. ASTM C 150 - Standard Specification for Portland Cement; 2004a.

F. ASTM C 330 - Standard Specification for Lightweight Aggregates for Structural Concrete; 2004.

G. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.

1.04 CONTRACTOR QUALIFICATIONS

A. Manufacturer Qualifications:

1. Only a firm which has had a minimum of five (5) years successful experience in the fabrication of architectural precast concrete units, similar to the units required for this project, will be acceptable. Fabricator must have sufficient production capacity to produce, transport, and deliver the required units without causing delay in the work.
2. Produce architectural precast concrete units at a fabricating plant engaged primarily in the manufacturing of similar units.

1.05 DELIVERY AND HANDLING

A. Handle and transport units in a position consistent with their shape and design in order to avoid stresses which would cause cracking and damage.

B. Lift or support units only at the points shown on the shop drawings.

C. Place nonstaining resilient spacers of even thickness between each unit.

D. Support units during shipment on nonstaining shock-absorbing material.

E. Do not place units directly on ground.

1.06 STORAGE AT JOB SITE

A. Store and protect units to prevent contact with soil, staining, and physical damage.

B. Store units, unless otherwise specified, with nonstaining, resilient supports located in same positions as when transported.

C. Store units on firm, level, and smooth surfaces.

D. Place stored units so that identification marks are discernible, and so that product can be inspected.

1.07 SAMPLES

A. Standard Samples:
   1. Submit samples representative of finished exposed face showing typical range of color and texture prior to commencement of manufacture.
   2. Sample Size: Approximately 12" x 12" and of appropriate thickness, representative of the proposed finished product.

1.08 SUBMITTALS

A. Shop Drawings:
   1. Content:
      a. Unit shapes (elevations and sections), and dimensions
      b. Finishes
      c. Reinforcing, joint, and connection details
      d. Lifting and erection inserts
      e. Location and details of hardware attached to structure
      f. Other items cast into panels
      g. Handling procedures and sequence of erection for special conditions
      h. Relationship to adjacent material
   2. Show location of unit by same identification mark placed on panel.

1.09 WARRANTY

A. Precast concrete work shall be warranted against all defects in workmanship and material for two (2) years from the date of substantial completion.

PART II—PRODUCTS

2.01 MANUFACTURERS

A. Precast concrete units are to be equal to those as manufactured by the following manufacturers.
   1. Quality Precast Corporation, Jonesboro, Arkansas
   2. Custom Architectural Precast, Olive Branch, Mississippi
   3. Gate Pre-Cast Company, Ashland City, Tennessee
   4. Conway Cast Stone, Conway, Arkansas

2.02 MATERIALS—GENERAL

A. Finish: Limestone texture or sand texture (sugar cube appearance).

B. Colors: Equal to Quality Precast Corporation, Sample No. QP-339; sample fabricated using crushed limestone aggregate, white cement and Sheridan masonry sand; finish is a limestone texture (almost smooth) with some aggregate exposed. Sample may be inspected at the architect's office.

2.03 MATERIALS—SPECIFIC

A. Concrete:
   1. Portland cement, ASTM C 150; as required to match specified samples. For exposed surfaces use same brand, type, and source of supply throughout.
   2. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C 494
   3. Coloring Agent:
      a. Synthetic mineral oxide
      b. Harmless to concrete set and strength
      c. Stable at high temperature
      d. Sunlight and alkali-fast
   4. Aggregates:

a. Provide fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire job. They shall be clean, hard, strong, durable, and inert, free of staining or deleterious material.
b. ASTM C 33 or C 330
c. Material and Color: As required to match approved samples
d. Maximum Size and Gradation: As required to match approved samples

5. Water: Free from deleterious matter that may interfere with the color, setting or strength of the concrete.

B. Reinforcing Steel:
1. Bars: Reinforce shall be galvanized when less than 1" cover; deformed steel - ASTM A 615, grade 60.
2. Wire Fabric:
a. Welded Steel: ASTM A 185
b. Welded Deformed Steel: ASTM A 497
3. Fabricated Steel Bar or Rod Mats: ASTM A 184

C. Grout:
1. Cement Grout: Portland cement, sand, and water sufficient for placement and hydration.
2. Non-Shrink Grout: Premixed, packaged ferrous and non-ferrous aggregate shrink resistant grout.

PART III—EXECUTION

3.01 CONCRETE MIXES

A. Concrete Properties:
1. Water-Cement Ratio: Maximum 40 pounds of water to 100 pounds of cement.
2. Air Entrainment: Amount produced by adding dosage of air entraining agent that will provide 19% + 3% of entrained air in standard 1:4 sand mortar as tested according to ASTM C 185; or minimum 3%, maximum 6%.
3. Coloring Agent: Not more than 10% of cement weight.
4. 28-Day Compressive Strength: Minimum of 5,000 psi when tested by 6 x 12 x 4 x 8 inch cylinders; or minimum 6,250 psi when tested on 4" cubes.

B. Facing Mix:
1. Minimum thickness of face mix after consolidation shall be at least 1" or a minimum of 1-1/2 times the maximum size of aggregates used; whichever is larger.
2. Water-cement and cement aggregate ratios of face and back-up mixes shall be similar.

3.02 FABRICATION

A. Finishes: Exposed face to match specified samples.

B. Cover:
1. Provide at least one inch cover for reinforcing steel.
2. Do not use metal chairs, with or without coating, in the finished face.
3. Provide embedded anchors, inserts, plates, angles and other cast-in items with sufficient anchorage and embedment for design requirements.

C. Curing: Cure precast units until 2,000 psi minimum compressive strength has developed before removing the units from the form, unless greater strength is required for stripping.

D. Panel Identification: Mark each precast panel to correspond to identification mark on ship drawings for panel location.

E. Acceptance: Architectural precast units which do not meet the color and texture range or the dimensional tolerances may be rejected at the option of the architect, if they cannot be satisfactorily corrected.

F. Fabricate in conformance with PCI MNL-117 and PCI MNL-135.

G. Maintain plant records and quality control program during production of precast units. Make records available upon request.

H. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.

I. Maintain consistent quality during manufacture.

J. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.

K. Locate hoisting devices to permit removal after erection.

L. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

M. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

3.03 CONCRETE TESTING

A. Make one compression test at 28 days for each day's production of each type of concrete.

B. Specimens:
   1. Provide two test specimens for each compression test.
   2. Obtain concrete for specimens from actual production batch.
   3. 6" x 12" or 4" x 8" concrete test cylinder, ASTM C 31
   4. Cure specimens using the same methods used for the precast concrete units until the units are stripped, then moist cure specimens until test.

C. Keep quality control records available for the architect upon request for two (2) years after final acceptance.

D. Quality control and inspection procedures to comply with applicable sections of MNL-117.

E. Water absorption test on unit shall be conducted in accordance with MNL-117.

3.04 WORKMANSHIP

A. Installation:
   1. Set precast units level, plumb, square and true within the allowable tolerances. General contractor shall be responsible for providing lines, center and grades in sufficient detail to allow installation.
   2. Provide temporary supports and bracing as required to maintain position, stability and alignment as units are being permanently connected.
   3. Non-cumulative tolerances for location of precast units shall be in accordance with MNL-117.
   4. Set non-load bearing units dry without mortar, attaining specified joint dimension with lead, plastic or cement spacing shims.
   5. Fasten precast units in place utilizing #276 stainless steel screw-on pin-type stone anchor as manufactured by Heckmann Building Products; www.heckmannanchors.com.

B. Patching:
   1. Mix and place patching mixture to match color and texture of surrounding concrete and to minimize shrinkage.
   2. Adhere large patch to hardened concrete with bonding agent.

C. Cleaning:
   1. After installation clean soiled precast concrete surfaces with detergent and water, using fiber brush and sponge, and rinse thoroughly with clean water.
   2. Use acid solution only to clean particularly stubborn stains after more conservative methods have been tried unsuccessfully.
   3. Use extreme care to prevent damage to precast concrete surfaces and to adjacent materials.
   4. Rinse thoroughly with clean water immediately after using cleaner.

D. Protection: The erector shall be responsible for any chipping, spalling, cracking or other damage to the units after delivery to the job site unless damage is caused in site storage by others. After installation is completed, any further damage shall be the responsibility of the general contractor.

3.05 ERECTION

A. Erect units without damage to shape or finish. Replace or repair damaged panels.
B. Erect units level and plumb within allowable tolerances.
C. Align and maintain uniform horizontal and vertical joints as erection progresses.
D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Brackett Krennerich Architects.
E. Fasten units in place with mechanical connections.
F. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers. Pack grout to base of unit.
G. Exposed Joint Dimension: 1/2 inch.
H. Seal perimeter and intermediate joints in accordance with Section 07 9005.

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 03 4843 – Precast Architectural Concrete.

B. Section 04 2000 - Unit Masonry: Installation of mortar and grout.

C. 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. Pigments for colored Mortar: Iron or chromium oxides with demonstrated stability and colorfastness. (For Precast Architectural Concrete units only).

   1. Colors: As require to match architect's color samples.

   2. Acceptable product: Use one brand throughout project.

      a. Color pigment Industries, Elgin, IL

      b. Solomon Colors, Springfield, IL

      c. Lone Star

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.

C. Use color mortar with moisture resistant additive at Precast Units only.

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 03 4843 - Precast Architectural Concrete.
D. Section 04 0511 - Masonry Mortaring and Grouting.
E. Section 05 5000 - Metal Fabrications: Loose steel lintels.
F. Section 06 1000 – Rough Carpentry: Nailing strips built into masonry.
G. Section 07 1113 - Bituminous Dampproofing.
H. Section 07 1900 - Water Repellants for Masonry Sealer.
I. Section 07 2113 - Board Insulation: Insulation for cavity spaces.
J. Section 07 6500 - Flexible Flashing
K. Section 07 9005 - Joint Sealers: Backing rod and sealant at control joints.

1.03 PRICE AND PAYMENT PROCEDURES

A. See Section 01 2100 – Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS

A. TMS 402/602 Building Code Requirements and Specifications for Masonry Structures, 2016.
B. ASTM A 82/A 82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
D. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
E. ASTM C 62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2017.
F. ASTM C 90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
G. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.
H. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
I. IMIAWC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.
J. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction; International Masonry Industry All-Weather Council; current edition.

1.05 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.

1.06 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.

1.07 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.

1.08 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

1.10 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.

B. Concrete Masonry Units (colored):
   1. To be normal weight concrete smooth masonry units with color additive chosen from manufacturers deluxe color range, equal to units manufactured by Nettleton Concrete Works, Jonesboro, Arkansas.
   2. Units manufactured with “Rain Block” by ACM Chemistries integral water replant.
   3. 4” x 8” x 8” at accent band, see elevations.
   4. Color: To be selected; submit samples.

C. Polished Face Concrete Masonry Units:
   1. To be light weight concrete masonry polished face units with color additive equal to units manufactured by Nettleton Concrete Works, Jonesboro, Arkansas.

2. Units manufactured with W.R. Grace "Dry Block" block additive.
3. Smooth uhnits to be used at wall veneer, parapet caps and bands as shown on the drawings.
   a. 4" x 8" x 16" solid block.
4. Color: To be selected from all available colors, including premium; submit samples.

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 1/4" 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.

C. See Section 01 2100 – Allowances.

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 (32 at CMU) 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.

F. Do not locate controls joints in bond beams over doors and windows. Bond beams extend 2'-0" beyond door jamb, typical.

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
   3. Interior Walls

B. Concrete Block: Non-Load Bearing (light weight)
   1. Interior non-load bearing partitions.

C. Concrete Block: Fire Rated
   1. 1 Hr. and ½ Hr. rated walls

D. Colored Concrete Block
   1. Block Accent Band, see elevations.

E. Polished Faced Concrete Masonry Units
   1. Exterior block as shown on drawings.

F. Face Brick:
   1. Exterior Veneer.

G. 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 3100 - Steel Decking.

C. Section 05 4000 - Cold Formed Metal Framing.

D. Section 05 4400 – Cold Formed Metal Trusses.

E. Section 05 5000 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2016.

B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2016.

C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts; 2014.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2020.

F. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished; 2018.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2021.

I. Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength, 2021.

J. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2021.

K. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

L. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2020.

M. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

N. ASTM E164 - Standard Practice for Ultrasonic Contact Examination of Weldments; 2019.

O. ASTM F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners; 2017.

P. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2020.

Q. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2020.

R. 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 3100
STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof deck.

B. Composite floor deck.

C. Supplementary framing for openings up to and including 12 inches.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete topping over metal deck.

B. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 18 inches and shear stud connectors.

C. Section 05 4000 – Cold-Formed Metal Trusses.

D. Section 05 5000 - Metal Fabrications: Steel angles.

1.03 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A 108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-finished; 2018.

C. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

D. ASTM A 1008/A 1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardened; 2020.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2020.

F. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2018.

G. SDI (DM) – Floor Deck Design Manual, Second Edition, Steel Deck Institute.

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings; 2002 (Ed. 2004).

I. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submittals procedures.

B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, cellular raceways and outlet box locations, pertinent details, and accessories.

C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

D. Certificates: Certify that meet or exceed specified requirements.

E. Submit manufacturer's installation instructions.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes and standards:
   1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
   2. AWS D1.1 "Structural Welding Code - Steel", and AWS D1.3 "Structural Welding Code-Sheet Steel".
   3. SDI "Design Manual for Composite Decks, Form Decks and Roof Decks".

B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Cut plastic wrap to encourage ventilation to avoid condensation.

B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

C. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Steel Deck:
   1. United Steel Deck, Inc.: www.njb-united.com.
   2. Vulcraft/Nucor Corporation: www.vulcraft.com.
   3. Wheeling Corrugating Co.: www.wheelingcorrugating.com.

2.02 STEEL DECK

A. Roof Deck: Non-composite type, fluted steel sheet:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), with G60/Z180 galvanized coating.
      a. Grade 33 or higher
   2. Primer: Shop coat of primer paint as specified for acoustical deck over cleaned and phosphatized substrate. Do not prime surfaces to be fireproofed.
   3. Structural Properties:
      a. Section Modulus: 0.234 inch cubed/ft.
      b. Span Design: Double.
   4. Minimum Metal Thickness, Excluding Finish: 22 gage.
   5. Nominal Height: 1.5 inches.
   6. Type "B" deck; 1.5 B 20
   7. Formed Sheet Width: 36 inch.
   8. Deck to be attached to structure with 5/8 inch puddle welds in a 36/4 pattern.
   9. Side Joints: Mechanically fasten with two (2) No. 10 Tec screws sidelap fasteners between supports.
   10. End Joints: Lapped, welded.

B. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33/230, with G60/Z180 galvanized coating.
      a. Grade 33 or higher.
   2. Structural Properties:
      a. Section Modulus: 0.224 inch cubed/ft.
   3. Span Design: Double.
   4. Minimum Metal Thickness, Excluding Finish: 20 gage.
   5. Nominal Height: 3 inches.
   6. Profile: Fluted 3 VL20
   7. Formed Sheet Width: 36 inch.
   8. Attach to structure with 5/8 inch puddle welds at 12 inches on center at all supports.
   9. End Joints: Butted, welded.

2.03 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A 36/A 36M steel, unfinished.
   1. Miscellaneous steel shapes.

B. Stud Shear Connectors: Made from ASTM A 108 Grade 1015 bars.

C. Welding Materials: AWS D1.1.

D. Fasteners: Galvanized hardened steel, self-tapping.

E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
   1. Use for decks up to 24 gauge.

F. Shop and Touch-Up Primer: SSPC-Paint 25, zinc oxide, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips, wet concrete stops, and cover plates, 22 gage thick sheet steel; of profile and size as indicated; finished same as deck.

B. Floor Drain Pans: 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below floor deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.

B. On concrete and masonry surfaces provide minimum 4 inch bearing.

C. On steel supports provide minimum 1-1/2 inch bearing.

D. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
   1. Welding: Use fusion welds through weld washers.

E. At mechanically fastened male/female side laps fasten at 36 inches on center maximum unless otherwise noted.

F. Weld deck in accordance with AWS D1.3.

G. At deck openings from 6 inches to 18 inches in size, provide 2 x 2 x 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.

H. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.

I. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

J. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.

K. Place metal cant strips in position and fusion weld.

L. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

M. Weld stud shear connectors through steel deck to structural members below.

N. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-load bearing formed steel stud exterior wall framing.
   1. Wind load requirements
   2. Earthquake code requirements; load from veneer

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Veneer masonry supported by wall stud metal framing.

B. Section 05 1200 - Structural Steel Framing: Structural building framing.

C. Section 06 1643 - Gypsum Sheathing: Wall sheathing.

D. Section 07 2116 - Blanket Insulation: insulation within framing members.

E. Section 07 4264 – Metal Composite Material Wall Panels.

F. Section 07 4618 – Exterior Metal Soffits.

G. Section 07 9005 - Joint Sealers.

H. Section 09 2116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

1.03 REFERENCE STANDARDS

A. AISI S100-16 (2020): North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020) with Supplements 1,2,3.

B. AIAI S202-20: Code of Standard Practice for Cold-Formed Steel Structural Framing, 2020.

C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016A.

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; 2017.

E. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; 2020.

F. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; 2013.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2020 and errata.

H. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society; 2018.

I. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).

J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002.

1.04 SUBMITTALS

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

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations and load tables.

C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements. Shop drawings shall include all connections detailed and distinguished.

D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention, and manufacturer's standard details.

E. Shop Drawings:
   1. Submit shop drawings showing complete details for fabrication and erection for all light gauge members.
   2. Include all components for a complete framing system.
   3. Provide templates for installation of all anchorage devices.
   4. Submit shop drawings for review prior to starting any work.
   5. Shop drawings shall be stamped and signed by an Engineer registered in the State of Arkansas.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

B. Installer: Company specializing in performing the work of this section with minimum 3 years of experience.

C. Contractor is responsible for design, fabrication and erection of steel stud framing to meet the requirements of the latest adopted Local Code.

D. Compute all structural properties in accordance with AISI "Specifications for the Design of Cold Formed Steel Structural Members."

E. Provide weldments as required in accordance with the American Welding Society (AWS)AWSD.13 "Structural Welding Code-Sheet Steel."

1.06 PROJECT CONDITIONS

A. Verify that field measurements are as indicated on the drawings.

B. Coordinate work of this section with the placement of components within the stud framing system.

1.07 SYSTEM DESCRIPTION

A. Design Requirements: The Supplier shall design and/or verify the size & strength of all light gauge cold formed Metal framing members and connections in accordance with The ML/SFA Lightweight Steel Framing Systems Manual.
   1. Design shall use the latest adopted local code for wind and seismic loads.
   2. Interior walls shall be designed for a minimum wind load of 10psf and exterior walls shall be designed for a minimum wind load of 20 psf.
   3. Maximum deflection of all exterior wall systems shall not exceed L/600 for studs backing masonry Veneer and L/360 for studs backing metal panel Veneer.
   4. See drawings for additional minimum requirements for metal stud anchorage at metal building frames and metal building purlins.

B. Design shall conform to: AISI Specification for the Design of Cold-Formed Steel Structural members. Wall bridging shall be designed to provide resistance to minor axis bending and wall rotation of wall studs. Designated selected exterior and/or interior walls shall be designed to provide frame stability and lateral load resistance. All connections (member to member, and member to structure) shall be designed and detailed. Allow a minimum of 1 ½" for frame deflection in connections where studs are connected to purlins or rigid frames.

C. Qualification of Field Welding: Qualify welding process and welding operators in accordance with AWS "Standard Qualification Procedure".

D. Minimum Exterior Stud sizes Spaced @ 16" o.c. (1 5/8" min flange width)

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing, Connectors, and Accessories:
   1. Dietrich Metal Framing: www.dietrichindustries.com.
   2. Clark Steel Framing Systems: www.clarksteel.com
   3. United States Gypsum Company: www.usg.com
   4. Nucon Steel www.nuconsteel.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.

C. Maximum Spacing and Layout Requirements: Exterior wall studs shall be spaced at 16 inches on center typical spacing and at 12 inches on center within 6 feet of all building corners.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C 955; studs formed to channel shape with punched web; U-shaped track in matching nominal width and compatible height.
   1. Base Metal: Structural Steel (SS), 33 ksi minimum yield strength
   2. Exterior Wall Studs, Minimum Size: See table on structural drawings and 1.07 System Description for minimum sizes.
   3. Galvanized in accordance with ASTM A 653/A 653M G60/Z180 coating.
   4. Provide components fabricated from ASTM A 1008/A 1008M, Designation SS steel.

B. Framing Connectors: Factory-made formed steel sheet, ASTM A 653/A 653M SS Grade 50, with G60/Z180 hot dipped galvanized coating and factory punched holes.
   1. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI North American Specification for the Design of Cold Formed Steel Structural Members; minimum 18 gage, thickness.

C. Fastening: Members may fastened together by welds, screw fasteners, drilled anchors or power-driven fasteners that fit the particular application.
   1. Securely weld or screw track and studs for fascia, bulkheads, and furr downs to roof framing above to support fascia, bulkheads, and furr downs in tension.
   2. Track attachment to concrete may be by proper use of drilled anchors or power-driven fasteners.
   3. Stud to track connections may be by welds or screw fasteners each side.
   4. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, screws and anti-friction bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
      a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
      c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.
      d. Acceptable Products: VertiClip(r) or DriftClip(tm) manufactured by The Steel Network Inc.

5. Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.

2.04 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, 16 gauge.06 inch thickness, finish to match framing components.

B. Plates, Gussets, Clips: Formed Sheet Steel, 16 gauge.06 inch thickness; finish to match framing components.

C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.05 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A 153/A 153M.
   1. Where screw attachment is allowed and detailed on the drawings.

B. Anchorage Devices: Power actuated.

C. Welding: In conformance with AWS D1.1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C 1007 requirements or as detailed on the drawings

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches on center or weld to structure as detailed on drawings. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at 16 inches on center typical and at 12 inches on center within 6 feet of all exterior building corners; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using welding method.

D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

E. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

F. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

G. Install intermediate studs above and below openings to align with wall stud spacing.

H. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

I. Attach cross studs to studs for attachment of fixtures anchored to walls.

J. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

K. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/4 inch.

END OF SECTION

SECTION 05 4400
COLD-FORMED METAL TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof trusses.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Cold-formed steel truss materials.
   2. Anchor bolts.
   3. Post-installed anchors.
   4. Power-actuated fasteners.
   5. Mechanical fasteners.

B. Sustainable Design Submittals:
   1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.

C. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated-Design Submittal: For cold-formed steel trusses.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
   1. Steel sheet.
   2. Expansion anchors.
   3. Power-actuated anchors.
   4. Mechanical fasteners.
   5. Miscellaneous structural clips and accessories.

D. Research Reports: For post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Qualify procedures and personnel according to the following:
   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel trusses.

B. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
   1. Design Loads: As indicated on Drawings.
   2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:
      a. Roof Trusses: Vertical deflection of 1/240 of the span.
   3. Design trusses to provide for movement of truss members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.

C. Cold-Formed Steel Truss Standards: Unless more stringent requirements are indicated, trusses shall comply with the following:
   1. Floor and Roof Systems: AISI S210.
   2. Lateral Design: AISI S213.
   3. Roof Trusses: AISI S214.

2.2 COLD-FORMED STEEL TRUSS MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
   1. Grade: As required by structural performance.
   2. Coating: G90 or equivalent.

2.3 ROOF TRUSSES

A. Roof Truss Members: Manufacturer's standard steel sections.
   1. Connecting Flange Width: 1-5/8 inches, minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
   2. Minimum Base-Metal Thickness: 0.0329 inch.
   3. Section Properties: As required by design.

2.4 TRUSS ACCESSORIES

A. Fabricate steel-truss accessories from steel sheet, ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for truss members.

B. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel hex-headed bolts carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193, ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel trusses to structure.
2. Type: Torque-controlled expansion anchor, Torque-controlled adhesive anchor, or adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.

D. Power-Actuated Fasteners: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Shims: Load-bearing, high-density multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as truss members supported by shims.

2.7 FABRICATION

A. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
1. Fabricate trusses using jigs or templates.
2. Cut truss members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:
1. Spacing: Space individual truss members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel truss to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting trusses and framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Install bridge, and brace cold-formed steel trusses according to AISI S200, AISI S202, AISI S214, and manufacturer's written instructions unless more stringent requirements are indicated.
1. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure.
2. Anchor trusses securely at all bearing points.

3. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's Technical Note 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses." unless otherwise indicted on Drawings.

D. Install cold-formed steel trusses and accessories true to line and location, and with connections securely fastened.
   1. Erect trusses with plane of truss webs plumb and parallel to each other. Align and accurately position trusses at required spacings.
   2. Erect trusses without damaging truss members or connections.
   3. Fasten cold-formed steel trusses by welding or mechanical fasteners.
      a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install temporary bracing and supports to secure trusses and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to trusses are secured.

F. Truss Spacing: 48 inches and as indicated on Drawings.

G. Do not alter, cut, or remove truss members or connections of trusses.

3.2 ERECTION TOLERANCES

A. Install cold-formed steel trusses level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel trusses with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
   1. Cold-Formed Steel Trusses Spanning 60 Feet or Longer: Verify temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed according to the approved truss submittal package.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Cold-formed metal trusses will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel trusses are without damage or deterioration at time of Substantial Completion.

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 and frames.
   3. Bearing plates for beams and anchors.
   4. Bolts and studs.
   5. Miscellaneous bracing angles and support angles.
   6. Steel lintels.

B. Mechanical equipment supports

C. Metal ladders

   1. Mechanical Equipment access ladder

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 5100 – Metal Stairs.

D. Section 05 5213 – Pipe and Tube Railings.

E. 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.

C. Mechanical Equipment Supports:
   1. Sub-framing for mechanical equipment hangers shall be provided as required.
   2. Unless otherwise detailed on the drawings, this sub-framing shall be 3 inches x 2-1/2 inches x 1/4 inch angles, long leg vertical.
   3. This sub-framing shall be bolted to the structure with 1/2 inch bolts.

D. Pit Ladder: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Rails: 2" x 3/8" steel plate.
   2. Rungs: ¾" dia. Steel rods, smooth
   3. Clips and Plates: As required.

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 5100
METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel stair framing and supports.

B. Integral balusters and handrails.

C. Anchorage.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans and landings.

B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.

C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

D. Section 05 3100 – Steel Decking.

E. Section 05 5000 - Metal Fabrications.

F. Section 05 5213 – Pipe and Tube Railings: Metal Handrails and balusters.

G. Section 05 7300 – Ornamental Handrails and Railings

H. Section 05 7316 – Railing Cable Systems

I. Section 09 9000 - Painting and Coating: Paint finish.

1.03 REFERENCE STANDARDS

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 2008.

B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

C. ASTM A 283/A 283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003.

D. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2004b.

E. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2004b.

F. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2003a.

G. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability; 2004b.

H. ASTM E 935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2000.

I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1998.

J. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2004 and errata.

K. NAAMM AMP 510 - Metal Stairs Manual; The National Association of Architectural Metal Manufacturers; 1992, Fifth Edition.

L. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2000).

M. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

1.04 DESIGN REQUIREMENTS

A. Manufactured stairs may be used in lieu of shop fabricated, subject to architect's approval.

B. Design and fabricate stair assembly to support a uniform live load of 100 lb/sq ft and a concentrated load of 300 lb with deflection of stringer or landing framing not to exceed 1/180 of span.

C. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E 985 and applicable local code.

D. Design railing assemblies, wall rails, and attachments to resist lateral force of 200 lbs at any point without damage or permanent set. Test in accordance with ASTM E 935.

E. Fabricate metal stairs to comply with NAAMM AMP 510, Class Architectural.

1.05 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.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.06 QUALITY ASSURANCE

A. Fabrication to be completed by a firm regularly engaged in metal fabrications with a minimum of three years experience.

B. Manufactured Stairs: Perform design and prepare shop drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Arkansas.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Sections: ASTM A 36/A 36M.

B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.

C. Steel Plates: ASTM A 283.

D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.

E. Ungalvanized Steel Sheet: ASTM A 1008/A 1008M, Designation SS, Grade 33, Type 1.

F. Tread and Landing Concrete Reinforcement: Mesh type as detailed, galvanized.

G. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1.

H. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; consistent with design of stair structure.

I. Welding Materials: AWS D1.1; type required for materials being welded.

J. Expansion Bolts: Hilti "Kwik Bolt"

K. Expansion Shields: FS. FF-S-325

L. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 COMPONENTS

A. Metal Pan Stair Treads: Concrete in metal pan; 2 inches deep; smooth surface; non-slip edge.
   1. 10 gauge as indicated on drawings.

B. Concrete: Type specified in Section 03 3000.

C. Metal Railings: Type as specified in Section 05 5213.

D. Railings: See Section 05 5213, Section 05 7300, and Section 05 7316.

2.03 FABRICATION - GENERAL

A. Fit and shop assemble components in largest practical sections, for delivery to site.

B. Fabricate components 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.

F. Fabricate components accurately for anchorage to each other and to building structure.

2.04 FABRICATION - PAN STAIRS AND LANDINGS

A. Fabricate stairs and landings with closed risers and treads of metal pan construction using ungalvanized steel sheet, ready to receive concrete.

B. Secure reinforced tread pans to stringers with clip angles; welded in place.

C. Form stringers with rolled steel channels and hollow steel sections (see drawings), 12 inches deep. Weld fascia plates to channels using 14 gage steel sheet across channel toes.

D. Form landings with minimum 12 gage sheet stock. Reinforce underside with angles to attain design load requirements.

E. Prime paint components.

2.05 FINISHING

A. Prepare surfaces to be primed in accordance with SSPC-SP 2.

B. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

C. Do not prime surfaces in direct contact with concrete or where field welding is required.

D. Prime paint items with one coat.

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 and embedded in masonry with setting templates.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.

B. Provide anchors, plates, angles, hangers, and struts required for connecting stairs to structure.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Field weld components indicated on drawings. Perform field welding in accordance with AWS D1.1.

E. Field bolt and weld to match shop bolting and welding. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

F. Mechanically fasten joints butted tight, flush, and hairline. Grind welds smooth and flush.

G. Obtain approval prior to site cutting or creating adjustments not scheduled.

H. After erection, prime welds, abrasions, and surfaces not shop primed, 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.

3.05 SCHEDULES

A. All Interior Stairs: Pan stairs and landings; primed finish.

END OF SECTION

SECTION 05 5133
METAL LADDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fixed Aluminum Wall Ladders.

B. Fasteners and Installation Accessories.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

B. Section 05 3100 – Steel Decking.

C. Section 05 5000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

A. ANSI A14.3 – American National Standard for Ladders – Fixed – Safety Requirements; 1992.

B. ASTM B 209/B 209M – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2001.

C. ASTM B 210 – Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2002.

D. ASTM B 221/B 221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.

E. ASTM B 308/B 308M – Standard Specification for Aluminum – Alloy T6061-T6 Standard Structural; 2002.

F. OSHA 29 CFR Standard 1910.27 – Fixed Ladders; Occupational Safety and Health; current edition.

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.
3. Installation methods.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than fifty years of experience.

1.06 WARRANTY

A. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: ALACO Ladder Co., Chino, CA, alacoladder.com; Model 564 parapet return with crossover platform.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 6000.

2.02 MATERIALS

A. Extruded Aluminum Profiles: ASTM B 221/221M, ASTM B 210, ASTM B 308/308M, Alloy 6061-T6; standard mill finish.

B. Aluminum Sheet and Plate: ASTM B 209/209M Alloy 6061-T6; standard mill finish.

C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs (1335 N) shear strength.

D. Cast Fittings, Connectors, and Rung Ends: Cast aluminum alloy 356.

2.03 LADDERS

A. Ladders – General: Comply with ANSI A14.3 and OSHA regulations.

B. Fixed Wall Ladders: Extruded aluminum; serrated rungs 1-1/8 inches in diameter, connected to 2-7/8 inches side rail channels with cast aluminum rung connectors, each secured to rails by means of four solid aircraft rivets.

1. Walk-Through and Parapet Railings: Aluminum extrusions; extend not less than 42 inches above landing, 24 inches between side rails at step through.

2.04 FINISHES

A. Provide all aluminum in standard mill finish.

B. Factory finish all aluminum surfaces with manufacturer's standard powder coating system.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch up, repair or replace damaged products before substantial completion.

END OF SECTION

SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stair railings and guardrails for interior stairs

B. Interior Guard Railings

C. Wall mounted handrails for stairs, steps, and ramps

1.02 RELATED REQUIREMENTS

A. Section 03 3000 – Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 04 2000 – Unit Masonry: Placement of anchors in masonry.

C. Section 05 5100 – Metal Stairs.

D. 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 concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. Posts: Provide adjustable flanged brackets.
   4. Floor Sleeve: Pipe sleeve of adequate size to receive railing.

E. Dimensions: See drawings for configurations and heights. (Stair B)
   1. Hand Rails: 1-1/2 inches outside diameter, round, standard steel pipe.
   2. Guard Railings:
      a. Top Rail: 2 inch x ½ inch steel bar.
      b. Intermediate Rails: 1 inch x 1 inch steel bar.

c. Posts: 1 inch x 1 inch steel bar.

d. Guard rail balusters: ¾ x ¾ steel bar.

e. Steel plate number wraps: Refer to Section 05 5000.

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

SECTION 05 7300
ORNAMENTAL HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stainless steel handrails, guard rails, and wall handrails.
   1. Stair "A"
   2. Second floor guard railing.

1.02 RELATED SECTIONS

A. Section 05 7316 – Railing Cable Systems, for cable system to be used with railing system specified in this section.

B. Section 06 2000 - Finish Carpentry, for wood top rail.

1.03 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.

C. Shop Drawings: Show layout, dimension, spacings, and anchorage; include field measured dimensions of spaces where railings are to be installed, if critical to proper fit.

D. Manufacturer's Certification: Certify that railings have been designed to meet the design criteria of the specified code; include all conditions or limitations of the design necessary to achieve the necessary strength for the loading specified.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

1.05 COORDINATION

A. Coordinate and provide instructions for installation of cable rail system to be installed in stainless steel railings.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: American Railing Systems, Inc., www.americanrailing.com

B. Substitutions: See Section 01 6000 – Product Requirements.

2.02 HANDRAILS AND RAILINGS

A. Handrails at Stairs: Pipe railing type.
   1. Size and configuration as indicated on drawings.
   2. Material: Type 304 stainless steel pipe, 1-1/2 inch Schedule 10, 1.9 inches (48 mm) outside diameter.
   3. Joints: Coped and fully welded with welds ground smooth.
   4. Provide brackets for mounting to railing posts and wall.
   5. Wall Mounting: Wall bracket; size to provide minimum of 1-1/2 inches (38 mm) clear space between top rail and wall.
   6. Rail Ends: Turn to wall or posts as shown on drawings.
   7. Stainless Steel Finish: Satin, No.4.

B. Guard Railings:
   1. Size and configuration as shown on the drawings.
   2. Material: Type 304 stainless steel tubes and plates.
   3. Joints: Coped and fully welded with welds ground smooth.

4. Top Rail: 2" x 5/16" stainless steel continuous plate welded to posts to receive wood finish rail.
5. Finish: Stainless Steel, Satin, No. 4

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor railings securely, in accordance with conditions of design criteria.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 05 7313
ORNAMENTAL HANDRAILS AND RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural (Tempered, Laminated) glass dry glazed railing assembly at Balcony 206 and Balcony 210.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 – Cast-In-Place Concrete

B. Section 05 5000 – Metal Fabrications

C. Section 07 1113 – Bituminous Dampproofing

D. Section 08 8000 - Glazing

1.03 REFERENCES

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

B. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

C. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass -- Kind HS, Kind FT Coated and Uncoated Glass; 2018.

1.04 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.

B. Manufacturer's data sheets on each product to be used, including dimensions, finish information, details of function, and mounting details.

C. Product Information: Grout and anchoring cement.

D. Verification Samples: Submit samples of each product specified, illustrating color and finish.

E. Shop Drawings:
   1. Locate each specified unit in project.
   2. Indicate mounting height of each unit.
   3. Include anchoring and fastening details.
   4. Provide drawings indicating all components, parts, pieces, and details for a complete working assembly to serve the design intent of the project.
   5. Include plans, elevations, sections, details, and attachments to other work.
   6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by qualified professional engineer licensed in the State of Arkansas responsible for their preparation.
   7. Product Test Reports: Based on the evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 935.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Provide factory-applied strippable vinyl coating to finished surfaces; leave in place until ready for final inspection.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.06 COORDINATION AND SEQUENCING

A. Coordinate installation of bracing and backing to receive products of this section.

B. Supply installation templates, required reinforcing, and recessed anchorage devices in timely fashion to installers of related work that will receive products of this section.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard replacement warranty against defects in materials and workmanship.

1.08 MOCK-UP

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Mock-Up Panel: One section of railing system for verification.

1. Approximate ¼ to ½ size using full size components.
2. Approval of mock-ups does not constitute approval of deviations from the Contract Documents unless such deviations are specifically approved by Architect in writing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. "VISION AL (aluminum) Railing" for glass as manufactured by Hollaender Manufacturing; 10285 Wayne Avenue, PO Box 156399, Cincinnati, OH 45215-6399.

B. Approved Equal.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 6300.

2.02 MATERIALS

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6005-T5.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429, Alloy 6061-T6.

a. Provide 1 ½ in IPS, (1.90 in OD) Standard Weight (Schedule 40) pipe for rails, Schedule 80 for posts, unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

G. Base Flange Castings: ASTM B 26/B 26M, Alloy Almag 535.

H. Structural Fittings and Panel Clips: Alloy 6063-T6.

2.03 FASTENERS

A. General: Provide the following:

1. Aluminum Railings: Type 302 stainless steel fasteners.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Structural Fasteners for Interconnecting Railing Components:

1. The top rail shall be connected to the main body of the post with Hollaender 255-8 EXT tees. Tee fittings shall be manufactured from 6063-T6 aluminum alloy and shall be internally connected to the rail by the means of 5/16" set screw that engages a lug on the 255-8 tee through the wall of the Sch. 80 post. The stainless steel set screw shall have an internal/external, reverse knurl, cup point. This combination shall prevent any loosening of the system due to changes in temperature or vibration. Systems using pop rivets or adhesives shall not be accepted.

D. Glass panels to be secured to posts using Hollaender 144-8 two piece glass panel clips. 144-8 clips will be manufactured from 6063-T6 aluminum alloy and secured to the rails using anodized aluminum tubular rivet nuts, size 5/16-18 UNC, and stainless steel socket head cap screws.

2.04 FLANGES AND ANCHORS

A. Flanges: For side mount, use Hollaender 52E-8 flange.

1. Provide neoprene gasket between extruded flanges and steel framing.

2.05 GLASS INFILL PANELS FOR RAILINGS

A. Tempered Glass: ASTM C 1048, Fully Tempered, Condition A, Type 1 (Transparent Flat Glass), Quality Q3. Products shall comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for Category 2 materials.

B. To meet IBC 2012, Monolithic Glass infill panel to be 3/8 inch thickness, with maximum spacing between posts to be 4 ft.

2.06 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch materials cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with non-welded connections, unless otherwise indicated.

H. Non-Welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fittings to be of the internal double tang type activated by a reverse knurl cup point set screw. Reverse knurl is required to ensure that screw does not come loose under vibration. Plain cup point screws will not be accepted. Fittings to be fastened to pipe by means of a 5/16 inch tubular rivet nut and socket head cap screw.

I. Form changes in direction as follows:

1. By flush bends or by inserting prefabricated flush-elbow fittings.

J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

K. Close exposed ends of railing members with prefabricated end fittings.

L. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated. Flanges to be sand cast from aluminum alloy 535 with anodized finish and fastened directly to the post by means of two reverse knurl cup point set screws.

M. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.07 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

2.08 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. Unless indicated otherwise, provide aluminum with the following finish:

1. Anodized Finish: AA-M10C22A41 (Architectural Class, .7 mil thickness or greater).

2.09 STRUCTURAL PERFORMANCE

A. Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:
   a. Uniform load of 50 lbf/ft. applied in any direction.
   b. Concentrated load of 200 lbf. Applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Top Rails of Guards:
   a. Uniform load of 50 lbf/ft. applied in any direction.
   b. Concentrated load of 200 lbf. Applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
3. Infill Area of Guards:
   a. Horizontal concentrated load of 50 lbf. Applied to 1 sq. ft. at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails.
   b. Glass infill shall have a safety factor of 4, and shall withstand a load of 200 lb. applied to a 1 sq. ft. area.

2.10 THERMAL MOVEMENTS

A. Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (range): 120 degrees F, ambient; 180 degrees F, material surfaces.

2.11 CONTROL OF CORROSION

A. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that reinforcement and anchoring devices are the correct type, have been located correctly, and have been installed properly.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Field verify all conditions of existing site features prior to fabrication of items in this specification section.

3.02 INSTALLATION

A. Install ornamental railings plumb and level and in full accordance with manufacturer's instructions.

B. Locate railings as indicated on the drawings and at heights that are in accordance with Americans with Disabilities Act.

C. Anchor to substrates in strict accordance with tested anchorage system, free from distortion or defects detrimental to appearance or performance.

D. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication.

E. Corrosion Protection: Coat concealed surfaces of aluminum brackets (mounting clamp) that will be in contact with steel with bituminous dampproofing per Section 07 1113.

F. Adjust railing before anchoring to ensure matching alignment at abutting joint.

3.03 CLEANING

A. Remove manufacturer's protective vinyl covering from exposed surfaces not more than 24 hours before final inspection.

B. Clean surfaces as required, following procedures and employing cleaning materials as recommended by accessories manufacturer.

3.04 PROTECTION

A. Protect installed products from damage by subsequent construction activities, until completion of project.

B. Field repair of damaged product finishes is prohibited. Replace products that have been damaged by subsequent construction activities.

END OF SECTION

SECTION 05 7316
RAILING CABLE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stainless steel cable and fittings for railing infill.

1.02 RELATED SECTIONS

A. Section 05 7300 - Ornamental Handrails and railings.

1.03 SUBMITTALS

A. See Section 01 3323 – Submittals, for submittal procedures.
   1. Product Data
   2. Shop Drawings: Indicate materials, sizes, fabrication, anchorage and installation details, and lengths for cable systems on shop drawings prepared by fabricator of cable supporting structure.
   3. Samples: Minimum 12 inch (300 mm) length of cable and each fitting and accessory proposed for the Project. Submit items in specified finish.
   4. Quality Assurance/Control Submittals:
      a. Qualifications: Proof of manufacturer's qualifications.
      b. Manufacturer's Installation Instructions.

B. Closeout Submittals: See Section 01 7800 - Close-Out Submittals; submit following items:
   1. Maintenance Instructions:
      a. Manufacturer's recommendation for periodic checking and adjustment of cables to maintain uniform cable tension.
      b. Manufacturer's recommendation for periodic cleaning to remove accumulated dirt, debris, and stains.

1.04 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Minimum five years experience in producing cable assemblies of the type specified.

1.05 DELIVERY, STORAGE AND HANDLING

A. Follow manufacturer's instructions.

1.06 WARRANTY

A. Special Warranty: Stainless steel cables and connectors – 10 year limited warranty against defects in materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Feeney Wire Rope & Rigging, 2603 Union St., Oakland, CA 94607. (510) 893-9473

B. Product: CableRail™ cable assemblies and fittings.

C. Substitutions: See Section 01 6000, Product Requirements.

2.02 MATERIALS

A. Cables: Type 316 stainless steel as specified below, polished finish, commercial, dry grade.

B. Fittings:
   1. Swage Style: Type 316 stainless steel, vibratory/tumbled finish.
   2. QuickConnect-SS™: Type 316 stainless steel body, mill finish.

2.03 COMPONENTS

A. CableRail™ Custom Cable Fittings and Assemblies:
   1. Cable:
      a. 1/4 inch (6.4 mm) diameter, 1x19 construction, Type 316, stainless steel.
      b. Coating: None
   2. Fittings:
      a. Type 316 stainless steel swage style terminals, turnbuckles and fixed ends and other hardware as recommended by manufacturer for installation conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine work to which cables will be anchored or will penetrate. Coordinate with responsible entity to perform corrective work as necessary.
   1. **Verify post size and cable spacing are in accordance with manufacturer's recommendations.**

B. Take field measurements and compare installation conditions to shop drawings. Notify manufacturer if field measurements vary from shop drawings.

3.02 INSTALLATION

A. Follow manufacturer's installation instructions.

B. Isolate dissimilar metals with grommets or bushings.

3.03 CLEANING

A. Clean cables thoroughly using synthetic scotch type pads and hot soapy water (or denatured alcohol or acetone) to remove residual lubricants; rinse thoroughly with clear water and wipe dry.

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. Preservative treatment of wood.

C. Fire retardant treatment of wood.

D. Miscellaneous framing and sheathing.

E. Telephone and electrical panel boards - Fire Retardant Treated.

F. Miscellaneous wood nailers and furring strips.

1.02 RELATED REQUIREMENTS

A. Section 06 1636 – Wood Panel Product Sheathing

B. Section 06 1643 Exterior Sheathing-Gypsum Board

D. Section 09 2116 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

A. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2002.

B. AWPA C27 - Plywood -- Fire-Retardant 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. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

E. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

F. 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 WWPA.
   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. Fire Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

C. 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.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

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. Miscellaneous Framing:
   1. Species: Southern Pine, Western Cedars.
   2. Grade: No. 2.

F. Miscellaneous Blocking, Furring, and Nailers:
   1. Lumber: S4S, No. 2 or Standard Grade.

2.03 EXPOSED BOARDS

A. Moisture Content: Kiln-dry (15 percent maximum).

B. Surfacing: S4S.

C. Species: Western Cedar, 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 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 U1, Use Category UCFA, Commodity Specification H, 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. Treat rough carpentry items as indicated.

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. 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 INSTALLATION - GENERAL

3.02 BULDING 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.

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.

3.03 FRAMING INSTALLATION

A. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.
   1. Attach to walls with screws.

END OF SECTION

SECTION 06 1636
WOOD PANEL PRODUCT SHEATHING

PART I-GENERAL

1.01 SECTION INCLUDES

A. Roof Decking

B. Floor Decking

1.02 RELATED SECTIONS

A. Section 05 4000 – Cold-Formed Metal Framing

B. Section 05 4400 – Cold-Formed Metal Trusses

C. Section 06 1000 - Rough Carpentry

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. Roof Decking: APA Rated OSB
   1. Decking
   2. Exposure Class: Exposure 1
   3. Span Rating: 40/20
   4. Thickness: 5/8"

B. Floor Decking at platform: APA Rated Plywood Floor Deck
   1. Tongue and Groove Floor Deck
   2. Span Rating: 24" o.c.
   3. Thickness: ¾"

C. 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-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. Attach panels per structural drawings.

END OF SECTION

SECTION 06 1643
GYPSUM SHEATHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior Wall Sheathing

1.02 RELATED SECTIONS

A. Section 05 4000, Cold Formed Metal Framing for Exterior Wall Studs

B. Section 06 1000, Rough Carpentry

1.03 REFERENCES

A. ASTM C1177/C 1177M Standard Specification for Glass Mat Gypsum Substrate for use as Sheathing; 2004.

B. ASTM C 1280 Standard Specification for Application & Gypsum Sheathing; 2004.

C. ASTM E 84 Standard Test Method for Surface Burning of Building Materials; 2004.

D. ASTM E 136 Standard Test Method for Behavior of Materials.

E. GA-253 Recommended Specifications for the Application of Gypsum Sheathing; Gypsum Association; 1999.

F. ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials.

G. ASTM C1396 Standard Specifications for Gypsum Board.

1.04 SUBMITTALS

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

B. Product data: Submit manufacturer's descriptive literature indicating material composition, thickness, sizes and fire resistance.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials to the job site in manufacturer's original packaging, containers and bundles with manufacturer's brand name and identification intact and legible.

B. Storage and Handling: Store level and handle materials to protect against contact with damp and wet surfaces, exposure to weather, breakage and damage to edges. Provide air circulation under covering and around stacks of materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Georgia-Pacific Corporation, www.gp.com; Dens Glass Gold Exterior Sheathing.

B. Certainteed, "Glassroc" sheathing.

2.02 SHEATHING BOARD

A. Composition:
   1. Gypsum sheathing manufactured in accordance with ASTM C 1177 with glass mats both sides and long edges, water-resistant treated core.

B. Characteristics - Regular Sheathing:
   1. Size: ½" thick, 4'-0" x 8'-0" and 4'-0" x 9'-0".
   2. Weight: 1.9 lb. per square foot.
   3. Fire Resistance:
      a. Non-combustible; ASTM E136.
      b. Flame spread 10, smoke developed 0; ASTM E84.

C. Characteristics – Fire Rated Sheathing:
   1. Size: 5/8" thick, 4'-0" x 8'-0" and 4'-0" x 9'-0".
   2. Weight: 2.5 lb. per square foot.

3. Fire Resistance:
   a. 1-hr, ASTM E119, ASTMC1396

2.03 ACCESSORIES

A. Joint Tape: 2" wide, 10 x 10 glass mesh tape.

B. Joint compound: ToughRock setting-type joint compound.

C. Screws, metal framing:
   1. Bugle head, self-tapping, rust-resistant, fine thread for heavy-steel gauge.
   2. No. 6 Type S or S-12, bugle head, self-tapping, rust resistant screws, 1" long.

D. Sealants, Caulk:
   1. Dow Corning 795 or equivalent; Pecora 895 or equivalent.
   2. Pecora AC-20 acrylic latex sealant; GE Silicone Silpruf Sealant; Tremco Dymonic or equivalent.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine subframing; verify that surface of framing and furring members to receive sheathing does not vary more than 1/4 inch from the placement of faces of adjacent members.

3.02 INSTALLATION - SHEATHING

A. Provide exterior sheathing where indicated on drawings. Install sheathing in accordance with manufacturer's instructions and applicable instructions in GA-253 and ASTM C 1280.

B. Install DensGlass Gold Exterior Sheathing with gold side out.

C. Use maximum lengths possible to minimize number of joints.

D. Metal framing: Attach exterior sheathing to metal framing with screws spaced 8" o.c. at perimeter where there are framing supports; and 8" o.c. along intermediate framing in field.

E. Drive fasteners to bear tight against and flush with surface of sheathing. Do not countersink.

F. Locate fasteners minimum 3/8" from edges and ends of sheathing panels.

G. Joints and fasteners covered using Dow Corning 795 Building Sealant, Pecora 895 or equivalent. Joints covered with 2" wide fiberglass mesh tape and Pecora AC20+ Silicone, GE Silicone Fasteners covered with sealant.

H. Apply approximately 5/8" bead of caulk along all joints. Apply fiberglass joint tape to all joints into caulking overlapping at intersections by the width of the tape. Apply caulk along the joint if required to fully bed tape. Apply caulk to each exposed fastener to cover completely when troweled smooth.

3.03 SCHEDULE

A. Typical Exterior Wall Conditions: 1/2" thick gypsum sheathing as shown on the drawings.

B. 5/8" Fire rated sheathing at locations shown on the drawings (indicated on drawings as 5/8" type "X").

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.
   1. Wood window sills
   2. Wood railings

1.02 RELATED REQUIREMENTS

A. Section 06 1000-Rough Carpentry

B. 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; 2018.

B. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress; National Hardwood Lumber Association; 2023.

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 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

2.04 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler 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.

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 Window Sills
2. Stair Railings

END OF SECTION

SECTION 06 6200
DECORATIVE PLASTIC SURFACING (SOLID PHENOLIC)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid phenolic surfacing for seat at typical ADA washroom (shower).

1.02 RELATED SECTIONS

A. Section 04 2000 Unit Masonry.

B. Section 05 5000 Metal Fabrications.

1.03 SUBMITTALS

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

B. Samples: Submit minimum 2" x 2" samples. Indicate full range of color and pattern variation.

1.04 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Manufacturer producing product in ISO 9001 certified facility.
   2. Fabricator/Installer must be experienced in performing work of similar type and scope.

1.05 DELIVERY, STORAGE & HANDLING

A. Storage and Protection: Store material protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrications schedule with construction progress to avoid construction delays.

PART 2 PRODUCTS

2.01 SOLID PHENOLIC PANELS

2.02 MANUFACTURER

A. Manufacturer: Wilsonart International

B. Substitutions: See Section 01 6000 – Product Requirements

2.03 MATERIALS

A. Thickness: ½"

B. Color: To be selected.

C. Finish: Matte

2.04 ACCESSORIES

A. Adhesive for bonding Plastic Surfacing (Product 117 – PVA Urea Formaldehyde, resorcinol) Edge treatment on drop edge – 2 part urethane Ashland Chemical 7779L)

2.05 FABRICATION

A. Fabricate solid phenolic panels and accessory items in accordance with manufacturer's recommendations and approved submittals.

B. Fabricate panels to profile indicated on the drawings.

PART 3- EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Examine surfaces for conditions that would adversely affect the performance of the decorative or edge performance.

3.02 INSTALLATION

A. Install solid phenolic panels level and accurately spaced in accordance with manufacture' s recommendations and approved submittals.

B. Fasten solid phenolic panels to supporting substrate with fasteners (And adhesive) approved for use with adjoining construction.

3.03 CLEANING AND PROTECTION

A. Clean decorative plastic surfacing in accordance with manufacturer's cleaning and maintenance instructions.

B. Protect installed product and finish surfaces from damage during construction.

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. Installed on exterior concrete block walls behind masonry veneer.
   2. Installed on exterior concrete block walls behind metal wall panels.

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 dampproofing 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 1300
SHEET WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sheet membrane waterproofing at precast concrete column caps.

B. Waterproofing accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 4843 – Precast Architectural Concrete

1.03 REFERENCE STANDARDS

A. ASTM D 412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension; 1998a (Reapproved 2002).

B. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.

C. ASTM 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials; 2001.

D. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 2004.

E. ASTM E 154 - Standard Test Methods for Water Vapor Retarders used in Contact with Earth; 1999.

F. ASTM E 96 - Standard Test Methods For Water Vapor Transmission of Materials; 2000.

1.04 SUBMITTALS

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

B. Product Data: Provide data for membrane.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Submit sample of manufacturer's warranty.

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with ten years experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1. Applicator to be approved in writing by membrane manufacturer.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

B. Follow manufacturer's printed requirements.

1.07 PRE-INSTALLATION MEETING

A. At least one week before beginning work, convene a pre-installation meeting to review conditions, installation procedures, schedules and coordination with other work.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Upon completion and acceptance of the work required by this section, the manufacturer will issue a warranty agreeing to promptly replace defective materials for a period of 5 years.

C. The formation or presence of mold or fungi in a building is dependent upon a broad range of factors including, but not limited to, the presence of spores and nutrient sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating systems and their maintenance and operating capabilities. These factors are beyond the control of the

manufacturer and the manufacturer shall not be responsible for any claims, repairs, restoration, or damages relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores, mycotoxins, or the like in any building or in the air, land, or water serving the building.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in original, factory-sealed, unopened containers bearing manufacturer's name and label intact and legible with the following information:
   1. Name of material.
   2. Manufacturer's stock number and date of manufacture.
   3. Material safety data sheet.

B. Store materials in protected and well ventilated area.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carlisle Coatings & Waterproofing, Inc; Product CCW Miradri 860/861 Sheet Membrane Waterproofing: www.carlisle-ccw.com.

B. Grace Construction Products; www.na.graceconstruction.com.

C. W.R. Meadows, Inc.; www.wrmeadows.com.

D. Pecora Corporation; www.pecora.com.

E. Substitutions: See Section 01 6000 – Product Requirements.

2.02 MEMBRANE MATERIALS

A. Composite Laminate Membrane: Comprised of 56 mil thickness of rubberized asphalt membrane and a 4 mil thickness of cross-laminated polyethylene film; 60 mil total thickness.
   1. release sheet on adhesive side.
   2. Sheet Width: 48 inch, minimum.
   3. Tensile Strength: 325 psi, measured in accordance with ASTM D412.
   4. Ultimate Elongation: 350 percent, measured in accordance with ASTM D412.
   5. Puncture Resistance: 60 lb. minimum in accordance with ASTM E 154.
   6. Peel Strength: 10 lb./in. width in accordance with ASTM D 903.
   7. Low Temperature Flexibility: Unaffected at -45 degrees F. in accordance with ASTM D 1970.
   8. Water Absorption: 0.1 percent increase in weight, maximum, measured in accordance with ASTM D570, 24 hour immersion.
   9. Water Vapor Permeability: 0.05 perm inch, measured in accordance with ASTM E 96.

2.03 ACCESSORIES

A. Primer: CCW-702, solvent base.

B. Membrane Sealant: CCW-703 Vertical Grade Liquiseal Membrane manufactured by Carlisle Coatings and Waterproofing.

C. Backing Rod: Closed-cell polyethylene foam rod.

D. Termination Bars: Aluminum; compatible with membrane and adhesives.

E. Adhesives: CCW-704 Mastic

F. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

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 waterproofing system.

C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions. Surface to be clean, dry and free from any surface contaminates or cleaning residue.

C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.

D. Install a 3/4 inch face, 45 degree cant of CCW-201 Polyurethane Sealant or CCW LM-800XL at all angle changes and inside corners including penetrations through walls.

E. All cracks over 1/16 inch in wide and all moving cracks under 1/16 inch in width shall be routed out to 1/4 inch minimum width and depth and filled flush with PT-304 or CCW-201 polyurethane sealant.

F. All expansion joints less than 1 inch wide shall be cleaned, primed, fitted with a backing rod and caulked with CCW-201 Polyurethane Sealant. For larger joints, contact Carlisle representative.

G. Allow all sealant to cure at least overnight.

H. Primer. Apply a thin film of primer 10" wide, centered over sealed cracks and joints, hairline cracks, and cold joints. Apply primer 8" on each side of all corners. Prime concrete around drain flanges. Allow primer to dry per manufacturer's recommendations.

I. Install an 8" wide strip of CCW MiraDRI 860-861 centered over joints and cracks. Install a 12" wide strip of CCW MiraDRI 860-861 centered over axis of all corners.

3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions.

B. Priming: Clean surfaces to remove residual dust before priming. Stir Primer. Apply by spray or roller at a rate recommended by manufacturer. Allow to dry per manufacturer's recommendation.

C. Vertical Surfaces: Apply in lengths of 8 feet or less. Overlap edge seams 2-1/2 inches. On walls over 8 feet high, apply in 8 foot sections, starting at the lowest point with the higher section overlapping the lower section 5 inches. Roll in place using firm pressure with a hand roller.

D. Terminations: Consult Carlisle 860-9 Details for proper terminations. Roll terminating edges firmly. Apply CCW-704 mastic to all terminations and > T=joints. Apply CCW-704 Mastic or CCW-703-V Liquiseal to laps at angle changes, extending 9 inches in each direction.

3.04 SCHEDULE

A. Precast Architectural Concrete Column Caps; see drawings.

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. Colored and polished faced exterior CMU.
   3. Precast Architectural Concrete.

1.02 RELATED REQUIREMENTS

A. Section 03 4843 - Precast Architectural Concrete

B. Section 04 2000 - Unit Masonry

C. 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: continuous insulation above grade at exterior walls.

1.02 RELATED SECTIONS

A. Section 03 3000 – Cast-in-Place Concrete

B. Section 04 2000 - Unit Masonry

C. Section 06 1643 – Gypsum Sheathing

D. Section 07 4264 – Metal Composite Material Wall Panels

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 and 2 inch; see drawings.
   3. Board Edges: Square.
   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 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 barrier 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: (FSK-25) 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 barrier 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 barrier 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 barrier 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.
   2. Foil Faced
      a. 6-1/4 inch thick, R-Value R-19.
      b. Install foil faced insulation when exposed on exterior walls and concealed locations.

B. Interior Walls:
   1. 6-1/4" thick, un-faced

END OF SECTION

SECTION 07 2217
POLYISOCYANURATE ROOF BOARD INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid board type roof insulation for thermal protection as part of roofing assemblies.
   1. Membrane Roofing

B. Roofing Crickets.

1.02 RELATED SECTIONS

A. Section 06 1636 – Wood Panel Product Sheathing – Roof Deck.

B. Section 07 5410 – Membrane Roof - TPO

1.03 REFERENCES

A. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2003.

B. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings; 2000.

C. UL 790 - Standard for Standard Test Methods for Fire Tests of Roof Coverings; 2004.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's specifications and installation instructions for insulation board and fasteners.

C. Shop Drawings: Roof plan showing layout of boards and fastening patterns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with general requirements specified in Section 01 6000.

B. Deliver insulation in packages labeled with material name, thermal value, and product code.

C. When stored outdoors, stack insulation on pallets above ground or roof deck, slit or remove packaging, and cover with tarpaulin or other suitable waterproof coverings.

1.06 PROJECT CONDITIONS

A. Comply with insurance underwriter's requirements applicable for products of this Section.

B. Do not install insulation on roof deck when water of any type is present. Do not apply roofing materials when substrate is damp or wet or when proper adhesive temperature cannot be maintained.

1.07 WARRANTY

A. Roof insulation is a part of the roofing warranty; see Section 07 5410.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Atlas Roofing Corporation; 1775 The Exchange, Suite 160, Atlanta, GA 30339; ASD. Tel: (770) 952-1442, Fax: (770) 952-3170.

B. ISO 95+ Polyisocyanurate Insulation by Firestone.

C. Owens Corning Corp.: www.owenscorning.com

D. Substitutions: See Section 01 6000, Product Requirements

2.02 MATERIALS

A. Glass Fiber-Faced Foam Roof Insulation: ACFoam-III; Closed-cell polyisocyanurate foam core with HCFC blowing agent, integrally laminated to heavy coated glass fiber

facers; conform to ASTM C 1289, Type II; UL 790 (ASTM E 108), Class A; FM 4450/4470, Class 1 fire rating.

1. FM wind uplift classification: 1-90.
2. Compressive Strength: 20 psi.
3. Provide tapered insulation systems as required.

B. Roofing Crickets: "Gemini" Pre-Cut Cricket System fabricated of factory cut and hinged, triangular shaped ACFoam and standard tapered ACFoam closed-cell polyisocyanurate foam core with a hydrocarbon blowing agent, integrally laminated to heavy non-asphaltic fiber-reinforced felt facers.

1. Compressive Strength: 20 psi.
2. Required Slope: 1/4 inch per foot.

2.03 RELATED MATERIALS

A. Nailers for roof Insulation:

1. Description: Structural grade No. 2 or better Southern Pine, Douglas Fir, or Exterior Grade Plywood. All wood shall be pressure treated for rot resistance.
   a. Nailer Width: Minimum 3-1/2 inches (nominal) wide or as wide as the nailing flange of each roof accessory.
   b. Nailer Thickness: Thickness of roof insulation.

B. Fasteners: Factory Mutual approved and as required by insulation manufacturer.

1. Heavy duty threaded fastener with protective coating and metal plates per manufacturer. Length shall be sufficient to penetrate deck a minimum of 1inch for wood deck.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine roof deck for suitability to receive insulation. Verify that substrate is dry, clean, and free of foreign material that will damage insulation or impeded installation.

B. Verify that roof drains, scuppers, roof curbs, nailers, equipment supports, vents, and other roof accessories, are secured properly and installed in conformance with drawings and submittals.

C. Verify that deck is structurally sound to support installers, materials, and equipment without damaging or deforming work.

3.02 INSTALLATION-GENERAL

A. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

B. Seal deck joints, where needed.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly fit insulation to all penetrations, projections, and nailers. Insulation shall be fit tightly, with gaps not greater than ¼". All gaps greater than ¼" shall be filled with acceptable insulation. Under no circumstances shall the roofing membrane be left unsupported over a space greater than ¼". Tapered insulation shall be installed around roof drains so as to provide proper slope for drainage. Miter roof insulation edges at ridge, valley and other similar non-planar conditions.

E. When installing multiple layers of insulation, all joints between layers shall be staggered at least 6 inches.

F. Minimum Thickness

1. 3" Minimum R-16.9 at roof.

G. System Minimum slope: 1 inch per foot. Tapered insulation required at select roof areas; see roof plan.

3.03 INSULATION APPLICATION-OSB (WOOD) ROOF DECK

A. Base Layer: Using a two-component, LVOC, low rise polyurethane adhesive (equal to "Twin Set" as manufactured by Firestone.) Anchor roof installation to wood roof deck per manufacturer instructions.

3.04 INSULATION APPLICATION – OSB (WOOD) ROOF DECK

A. All layers to be set in foam adhesive per manufacturer's recommendations.

3.05 CLEANING/PROTECTION

A. Remove trash and construction debris from insulation before application of roofing membrane.

B. Do not leave installed insulation exposed to weather. Cover and waterproof immediately after installation.
   1. Temporarily seal exposed insulation edges at the end of each day by lapping roofing membrane over edge to form a seal.
   2. Remove membrane seal when work resumes.
   3. Remove installed insulation that has become wet or damaged and replace with new solid and dry insulation material.

C. Protect installed insulation and roof membrane from traffic by use of protective covering materials during and after installation.

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 04 2000 – Unit Masonry

B. Section 06 1000 - Rough Carpentry

C. Section 06 1643 – Gypsum Sheathing

D. Section 07 4264 – Metal Composite Material Wall Panels

E. 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.

3.02 SCHEDULE

A. Use weather resistant membrane under brick, metal panels, etc. and areas noted in the drawings.

END OF SECTION

SECTION 07 2510
BITUMINOUS VAPOR BARRIER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor barrier to be applied to roof.

1.02 RELATED SECTIONS

A. Section 06 1636 – Wood Panel Product Sheathing (OSB)

B. Section 07 6100 – Sheet Metal Roofing

1.03 REFERENCES

A. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Roofing Felt used in roofing and waterproofing; 1997a.

PART 2 PRODUCTS

2.01 MATERIALS

A. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D 226, Type I, No. 30.
   1. 30 lb. felt

PART 3 EXECUTION

3.01 INSTALLATION

A. Install at joint between concrete block foundation wall and concrete floor slab as detailed on structural drawings.

END OF SECTION

SECTION 07 2600
VAPOR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor barrier under concrete floor slabs on grade.
   1. All Interior floor slabs.

B. Tape to seal joints and repair vapor barrier.

C. Pipe boots for sealing penetrations.

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 BARRIERS - 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 barrier.

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 barriers. 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 barrier in accordance with manufacturer's instructions and ASTM E 1643 at concrete slabs.

B. Install vapor barrier 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 barriers 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 4264
METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, anchors to structure, shims, furring, fasteners, and sealants attached to solid backup for a complete installation.

B. Matching flashing and trim.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 – Unit Masonry

B. Section 05 4000 - Cold Framed Metal Framing: Exterior wall studs.

C. Section 07 2501 - Weather Resistant Membranes: Installation of air barriers behind wall system.

D. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. AAMA 508-05 Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding System.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum ; 1998.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel ; 2008.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products ; 2009.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware ; 2009.

F. ASTM A 276 - Standard Specification for Stainless Steel Bars and Shapes ; 2005.

G. ASTM A 480/A 480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip ; 2004a.

H. 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.

I. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar ; 2003.

J. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process ; 2003.

K. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate ; 2004.

L. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes ; 2004a.

M. ASTM D 523 - Standard Test Method for Specular Gloss ; 1989 (Reapproved 1999).

N. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives ; 1998 (Reapproved 2004).

O. D 3359 Methods for Measuring Adhesion by Tape.

P. D 2247 Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

Q. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics ; 1996 (Reapproved 2001).

R. ASTM D 3359 - Standard Test Methods for Measuring Adhesion by Tape Test.

S. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.

T. ASTM D 1308 - Standard Test Method for Effective of Household Chemicals on Clear and Pigmented Organic Finishes.

U. ASTM D 3363 - Method for Film HArdness by Pencil Test.

V. ASTM D 2244 - Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates ; 2002.

W. ASTM D4145 - Standard Test Method for Coating Flexibility of Prepainted Sheet ; 1983 (Reapproved 2002).

X. ASTM D 4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films ; 1998.

Y. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials ; 2005.

Z. 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.

AA. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference ; 2002 (Reapproved 2010).

AB. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors By Uniform Static Air Pressure Difference ; 2000 (Reapproved 2009).

AC. NFPA 285 - Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload Bearing Wall Assemblies Containing Components Using the Intermediate Scale Multi-Story Test Apparatus ; 1998.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals.

B. Wall System Manufacturer Qualifications.

C. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
   1. Finish manufacturer's data sheet showing physical and performance characteristics.
   2. Storage and handling requirements and recommendations.
   3. Fabrication instructions and recommendations.
   4. Specimen warranty for finish, as specified herein.

D. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
   1. Physical characteristics of components shown on shop drawings.
   2. Storage and handling requirements and recommendations.
   3. Installation instructions and recommendations.
   4. Specimen warranty for wall system, as specified herein.

E. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, number of anchors, supports, reinforcement, trim, flashings, and accessories.
   1. Indicate panel numbering system.
   2. Differentiate between shop and field fabrication.
   3. Indicate substrates and adjacent work with which the wall system must be coordinated.
   4. Include large-scale details of anchorages and connecting elements.

5. Include large-scale details or schematic, exploded or isometric diagrams to fully explain flashing at a scale of not less than 1-1/2 inches per 12 inches.
6. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

F. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

G. Verification Samples: For each finish product specified, minimum size 12 inches square, representing actual product in color and texture.

H. Installer's Qualifications.

I. Certificate: Certify that the work results of this section meet or exceed specified requirements.

J. Maintenance Data: Care of finishes and warranty requirements.

K. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with International Building Code, 2009 edition.

B. Wall System Manufacturer Qualifications: Company specializing in manufacturing products specified in this section.
1. With not less than three years of documented experience.
2. Approved by MCM sheet manufacturer.
3. Submit contact names and phone numbers for at least three references connected with successful past projects.
4. Field measurements should be taken prior to the completion of shop fabrication whenever possible.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section.
1. With minimum 3 years of documented experience.
2. Approved by wall system manufacturer.
3. Submit contact names and phone numbers for at least three references connected with successful past projects.

D. Mock-Up: Provide a mock-up for evaluation of fabrication workmanship.
1. Locate where directed. Provide a minimum of 4ft. x 6ft. sample of each color for architects approval.
2. Provide panels finished as specified.
3. Mock-up may remain as part of the Work.

E. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, co-ordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.
1. Require attendance by the installer and relevant sub-contractors.
2. Include MCM sheet manufacturer's representative and wall system manufacturer's representative to review storage and handling procedures.
3. Review in detail truck transportation, parking, vertical transportation, schedule, personnel, installation of adjacent materials and substrate.
4. Review procedures for protection of work and other construction.
5. Review safety precautions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
1. Protect finishes by applying heavy duty removable plastic film during production.

2. Package for protection against transportation damage.
3. Provide markings to identify components consistently with drawings.
4. Exercise care in unloading, storing and installing panels to prevent bending, warping, twisting and surface damage.

B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
1. Store in well ventilated space out of direct sunlight.
2. Protect from moisture and condensation with tarpaulins or other suitable weather tight covering installed to provide ventilation.
3. Store at a slope to ensure positive drainage of any accumulated water.
4. Do not store in any enclosed space where ambient temperature can exceed 120 degrees F.
5. Avoid contact with any other materials that might cause staining, denting, or other surface damage.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid delays.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Wall System Warranty: Provide joint written warranty by manufacturer and installer, agreeing to correct defects in manufacturing or installation within a two year period after Date of Substantial Completion.

C. MCM Sheet Manufacturer's Finish Warranty: Provide manufacturer's written warranty stating that the finish will perform as follows for minimum of 20 years:
1. Chalking: No more than that represented by a No.8 rating based on ASTM D4214.
2. Color Retention: No fading or color change in excess of 5 Hunter color difference units, calculated in accordance with ASTM D2244.
3. Gloss Retention: Minimum of 30 percent gloss retention, when tested in accordance with ASTM D523.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Composite Material Sheet Manufacturers:
1. Citadel Architectural Products; Envelope 2000 – Reveal (RV) System; Greenfield, IN; www.citadelp.com

B. Wall Panel System Manufacturers:
1. Same as MCM Sheet manufacturers.

2.02 MATERIALS

A. Metal Composite Material (MCM):
1. Panel:

Envelope 2000® as manufactured by Citadel Architectural Products

a. Composition:
Face: .024" (min) prefinished smooth aluminum
Core: .105" thermoset phenolic resin
Back: .010" primed smooth aluminum
b. Thickness: 4mm (nominal)
c. Weight: 1.25 lbs/ft²
d. Tolerance:
Thickness: ±1/32"
Length / Width: +0, -1/8"

Squareness: 1/64" per lineal ft

e. Performance:
1. Surface Burning Characteristics: Panel shall have a Class A rating with a Flame Spread Index less than 25, and a Smoke Developed Index less than 450. Testing shall be in accordance with ASTM E84.
2. Bond Integrity: Panel shall have a minimum peel strength of 34.5 lb-in/lb. Testing shall be in accordance with ASTM D1781.
3. Ignition Temperature: Panel shall have a minimum self-ignition temperature of 900° F. Testing shall be in accordance with ASTM D1929.
4. Impact Resistance: Panel shall not have a deformation measuring larger than 0.186" in diameter or 0.007" in depth after being struck by a falling ball at 24 in-lb. Testing shall be in accordance with ASTM D5420.
5. Rate Of Burning: Panel shall have a CC1 Classification indicating a burning extent of 1" (25.4mm) or less when tested at a nominal thickness of .060" (1.5mm) or thickness of intended use. Testing shall be in accordance with ASTM D635.
6. Tensile Strength: Panel shall have a mean value of 1650 lbs. Testing shall be in accordance with ASTM C297.

2. Finish:

a. Polyvinylidene Fluoride (PVDF):
1. Type: Kynar 500® coating using 70% resin. Finish shall be in conformance with AAMA 2605.
2. Color:
a) As selected by Architect from manufacturer's color guide.
b) Custom color to match Architect's standard.
3. Composition:
a) Two-Coat Colors: 0.2-mil primer coat, 0.8-mil color coat
b) Three-Coat Colors: 0.2-mil primer coat, 0.8-mil color coat, 0.7-mil clear coat
4. Performance:
a) Gloss: Finish shall have a gloss value of 20-35 at 60°. Testing shall be in accordance with ASTM D523.
b) Solar Reflectance: Finish shall have a value of >25% initial, >15% after 3 years for Steep Slope and a value of >65% initial, >50% after 3 years for Low Slope Testing shall be in accordance with ASTM E903.
c) Emissivity: Finish shall have a value of 0.80 (80%) min. Testing shall be in accordance with ASTM C1371.
d) Pencil Hardness: Finish shall have a value of F-2H. Testing shall be in accordance with ASTM D3363.
e) Flexibility: Finish shall have a value of 0-2 T-bend, no pick off. Testing shall be in accordance with ASTM D4145.
f) Adhesion: Finish shall have a value of No Adhesion Loss. Testing shall be in accordance with ASTM D3359.
g) Reverse Impact: Finish shall have a value of No Cracking Or Adhesion Loss. Testing shall be in accordance with ASTM D2794.
h) Abrasion: Finish shall have a value of 65-85 l/mil. Testing shall be in accordance with ASTM D968.
i) Mortar Resistance: Finish shall have a value of No Effect. Testing shall be in accordance with ASTM C267.
j) Detergent Resistance:

Finish shall have a value of No Effect using 3% detergent @ 100 F° (72 hrs). Testing shall be in accordance with ASTM D2248.

k) Acid Resistance: Finish shall have a value of No Effect using 10% muriatic acid (24 hrs) and No Effect using 20% sulfuric acid (18 hrs). Testing shall be in accordance with ASTM D1308.

l) Acid Rain: Finish shall have a value of No Objectionable Color Change after 15 cycle min.Testing shall be in accordance with Kesternich SO2, DIN 50018.

m) Alkalai Resistance: Finish shall have a value of No Effect using 10%, 25% NaOH (1 hr). Testing shall be in accordance with ASTM D1308.

n) Salt Spray Resistance: Finish shall have a value of No Face Blistering; Max average 1/16" scribe creep, passes 4000 hrs using 5% salt fog @ 95° F. Testing shall be in accordance with ASTM B117.

o) Humidity Resistance: Finish shall have a value of Passes 4000 hrs, No #8 blisters using 100% relative humidity @ 95° F. Testing shall be in accordance with ASTM D714, ASTM D2247.

p) Exterior Exposure: Finish shall have a value of Max 5 fade and Max 8 chalk at 10 yrs @ 45°, south Florida. Testing shall be in accordance with ASTM D2244, ASTM D4214.

B. Installation System:

1. Reveal (RV) System:

a. Description: Field-assembled installation system consisting of metal composite material (MCM), trim moldings, silicone sealant, and accessories to provide a barrier system.

b. Performance:

1. Air Infiltration: Installation system shall not allow air infiltration in excess of 0.06 cfm/ft² at 1.57 psf. Testing shall be in accordance with ASTM E283.
2. Structural Performance: Installation system shall have a design load of 35.0 psf applied in the positive and negative direction. There shall be no deflection in excess of L/175 of the span of any support member nor shall there be any failure of the system. At a structural test load equal to 1.5 times the specified design load, no support member shall have permanent deformation in excess of 1/1000 of its span nor shall there be any failure of the system. Testing shall be in accordance with ASTM E330.
3. Water Penetration: Installation system shall not have uncontrolled water penetration to the room side at a static air pressure differential of 15.0 psf. Testing shall be in accordance with ASTM E331.

c. Trim Moldings:

1. CRAX-1 Horizontal / Vertical (Reveal)
2. CRAX-2 Perimeter J (Reveal)
3. CRAX-3 Perimeter J
4. CRAX-4 Inside Corner
5. CRAX-5 Outside Corner
6. CRAX-6 Horizontal / Vertical (3" Reveal)
7. CRAX-7 Horizontal / Vertical

8. CRAX-8 Outside Corner (Adjustable)
9. CRAX-9 Inside Corner (Adjustable)

C. Accessories:
   1. Extrusions:
      a. Shall conform with ASTM B211 and the manufacturer's recommendations.
      b. Shall be applied in accordance with the panel manufacturer's installation guidelines.
   2. Sealants:
      a. Selected from the panel manufacturer's approved list of sealants.
      b. Shall be applied in accordance with both the panel manufacturer's installation guidelines and the sealant manufacturer's recommendations.
   3. Fasteners:
      a. Selected by contractor to suit project requirements.
      b. Shall be applied using the recommended fastener schedule in accordance with panel manufacturer's installation guidelines.
      c. Shall be coated to prevent corrosion and/or reaction with other materials.
      d. Shall be concealed except where unavoidable. Exposed fasteners shall be finished to match adjoining metal.
   4. Flashing:
      a. Selected by contractor to suit project requirements.
      b. Shall be installed in such a manner to maintain the integrity of the wall system against moisture intrusion.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate to receive the work of this section to verify that the conditions are acceptable for installation.
   1. Substrate to receive panels shall be even, smooth, sound, clean, dry, and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work.
   2. Substrate to receive panels shall be in vertical and horizontal alignment with no more deviation than 1/4" in 20'.

B. Proceed with installation only after all unsatisfactory conditions have been corrected in a manner acceptable to installer. Starting work within a particular area will be construed as installer's acceptance of surface conditions.

3.02 PREPARATION

A. Verify dimensions as required.

B. Protect adjacent work areas and finished surfaces to prevent damage that otherwise might occur during the work of this section.

3.03 INSTALLATION

A. Wall panel assembly shall be installed in accordance with the manufacturer's written installation guidelines and the approved set of shop drawings.

B. Erect wall panel assembly level and true to the intended plane.

C. Maximum deviation from vertical and horizontal alignment of erected wall panel assembly shall be no more than 1/4" in 20'-0".

D. Maximum deviation in panel flatness shall be 0.6% of the assembled units.

E. Seal all joints as required using methods and materials as recommended by the panel manufacturer.

3.04 CLEANING

A. Remove panel masking immediately after installation. Delay will result in difficulty with removal and possibly residue on the panel surface.
B. Remove temporary coverings and protection to adjacent work areas.
C. Remove and legally dispose of construction debris from project site.

END OF SECTION

SECTION 07 4618
EXTERIOR METAL SOFFITS

PART 1—GENERAL

1.01 SECTION INCLUDES

A. Manufactured Metal Soffit Panels

1.02 RELATED SECTIONS

A. Section 05 4000 – Cold-Formed Metal Framing: Wall panel substrate.

B. Section 07 2501 – Weather Resistant Membranes

C. Section 07 9005 – Joint Sealers

1.03 REFERENCES

A. ASTM A 653/A653M – Standard Specifications 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. Submit manufacturer's data sheets.

C. Submit sample color chart for color selection.

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 PROTECTION

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. Correct defective work within a five year period after substantial completion for degradation of panel finish, including color fading caused by exposure to weather.

C. Correct defective work within a two year period after substantial completion, including defects in water tightness and integrity of seals and fasteners.

D. Provide 20 year manufacturer warranty on Kynar finish.

PART 2—PRODUCTS

2.01 MANUFACTURERS

A. Metal Soffit: Equal to "Artisan I, Series L, 12 inch soffit panels as manufactured by MBCI, Hernando, Mississippi.

2.02 MATERIALS

A. Pre-Coated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A 653/A 653M structural steel with G90/Z275 coating with specified finish coating.

B. Exterior Finish Coating: Panel manufacturer's standard Kynar 500 finish.

2.03 MANUFACTURED PANELS

A. Metal Soffit – Solid:
   1. 1 inch deep, 12 inch wide panels, 24 gauge.
   2. Concealed fastening system

3. Finish: Kynar 500
4. Color: To Be Selected

2.04 ACCESSORIES

A. Provide all trim to make a complete installation as shown on the drawings.

B. Fasteners:
   1. Per manufacturer's recommendations.

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 INSTALLATION

A. Install panels at soffits 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.

E. Provide expansion joints where indicated.

F. Use concealed fasteners unless otherwise approved by architect.

3.02 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: ¼ inch

3.03 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 05 4400 – Cold-Formed Metal Trusses.

B. Section 06 1636 – Wood Panel Product Sheathing.

C. Section 07 2217 – Polyisocyanurate Roof Board Insulation.

D. Section 07 6200 - Sheet Metal Flashing and Trim.

E. 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.

H. Snow Retention System: Install Snow Retention Systems as shown in the drawings. Snow Retention System shall be compatible with roof manufacturer's warranty.
   1. System: S-5! Color Guard or equal.
      a. Crossmember: Unpunched.
      b. S-5! VersaClip.
      c. Color Strip: to be provided by roofer from same material as roof panel SnoClip.
      d. Provide all clamps, snowclips, cross members, splices, and accessories for a complete system installation

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 05 4000 – Cold-Formed Metal Framing.

B. Section 05 4400 – Cold-Formed Metal Trusses.

C. Section 06 1636 – Wood Panel Product Sheathing.

D. Section 07 4264 – Metal Composite Material Wall Panels.

E. Section 07 6100 – Sheet Metal Roofing.

F. Section 07 6500 - Through-wall flashings in masonry.

G. Section 07 7123 – Manufactured Gutters and Downspouts.

H. 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.

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.

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 03 4843 – Precast Architectural Concrete.

B. 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 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. 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. As shown on the drawings.

B. Downspouts: CDA Rectangular profile. 5”x6”.

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 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and/ or floor assemblies.

B. Firestopping of all penetrations and interruptions to fire rated assemblies. Install safing insulation and safing sealant at all piping and "poke through" openings in rated partitions and assemblies.

C. Firestopping of joint between rated partitions and roof structure.

1.02 RELATED SECTIONS

A. Section 07 9005 - Joint Sealers.

B. Section 09 2116 - Gypsum Board Assemblies

C. Section 21 - Fire Suppression

D. Section 22 - Plumbing

E. Section 23 - HVAC

F. Section 26 - Electrical

1.03 REFERENCE STANDARDS

A. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials"

B. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2000a.

C. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 2002.

D. ASTM E 1966, "Standard Test Method for Fire Resistive Joint Systems"

E. ASTM E 2174, "Standard Practice for On-site Inspection of Installed Fire Stops"

F. ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus"

G. ASTM G 21, "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi"

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition; www.aqmd.gov.

I. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; UL 1479 "Fire Tests of Through-Penetration Firestops" and UL 2079 "Tests for Fire Resistance of Building Joint Systems"; current edition.

J. Alternate Systems: "Omega Point Laboratories Directory"; current edition.

K. NFPA 101 - Life Safety Code

L. NFPA 70 - National Electrical Code

M. International Building Code, 2021 edition.

1.04 SUBMITTALS

A. See Section 01 3323 - Submittals, for submitted procedures

B. Product Data: Manufacturer's specifications and technical data for each material including the UL system number, composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions.

C. Submit material safety data sheets and certificates of compliance provided with product delivered to job-site.

D. Systems are to be adjusted to meet specific conditions that occur at the project site.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping System Design Listing by a testing and inspection agency in accordance with the appropriate ASTM Standard(s). Firestopping tests to be performed by a qualified testing and inspection agency, including UL, FM research, or another agency performing testing and follow-up inspection services, that is acceptable to authorities having jurisdiction.

B. Firestop System installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum (3) three years documented experience.

D. Installer Qualifications: Experienced company specializing in performing the work of this section who is certified, licensed, or otherwise qualified by the firestopping manufacturer and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:.
   2. With minimum (3) three years documented experience installing work of this type.
   3. Able to show at least (5) five satisfactorily completed projects of comparable size and type.
   4. Licensed by authority having jurisdiction.
   5. Approved by firestopping manufacturer.

E. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer/architect prior to penetrating any load bearing assembly.

F. Obtain firestop products and systems from a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for (3) three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079, ASTM E 1966, ASTM E2307 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each Separate instance.

B. Sealants, caulking or spray materials for use with fire-rated construction joints and other gaps, the following products are acceptable:
   1. Hilti Elastomeric FireStop Sealant (CP 601S)
   2. Hilti Flexible Firestop Sealant (CP 606)
   3. Hilti Spray-able Fire-Rated Mastic (CP 672)

C. Mineral wool packing materials for use with fire-rated construction joints and other gaps, the following products are acceptable:

1. Owens Corning "Thermafiber" Safing Insulation
2. Or Equal

2.02 MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:
   1. Hilti, Inc., Tulsa, Oklahoma, 800-879-8000, www.us.hilti.com
   2. Substitution requests shall be considered in accordance with contract provisions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings and joints are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction per Section 109, IBC 2021 edition.

C. Install labelling as required by code.

D. All openings and joints must be protected in compliance with the Arkansas Fire Prevention Code (IBC 2021 edition).

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces of firestopping materials.

B. Protect adjacent surfaces from damage by material installation.

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

A. Section 03 3000 – Cast-in-Place Concrete.

B. Section 07 6200 – Sheet Metal Flashing & Trim.

C. Section 07 6500 – Flexible Flashing: Sealants required in conjunction with through wall flashing.

D. Section 07 8400 – Firestopping.

E. Section 08 8000 - Glazing: Glazing sealants and accessories.

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 C 834 - 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
      a. Preformed Compressible Foam Sealers:
         1) EMSEAL Joint Systems, Ltd: www.emseal.com
         2) Sandell Manufacturing Company, Inc: www.sandellmfg.com
         3) Dayton Superior Corporation: www.daytonsuperior.com
         4) W.R. Meadows, Elgin, Illinois
      b. Sealant System Backing:
         1) W.R. Meadows, Elgin, Illinois

2.02 SEALANTS

A. Type A - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, 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.

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 C 834, Type OP, Grade NF single component, paintable.
   1. Color: Standard colors matching finished surfaces.
   2. Product: Trademate manufactured by Dow Corning.

D. Type D - Bathtub/Tile Sealant: White silicone; ASTM C 920, 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 bath countertops and wall surfaces.

E. Type E - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, 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 C 1193.

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 C 1193.

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. Fire Rated and Non-fire-rated steel frames and doors.

B. Steel glazing frames non-rated.

C. Thermally insulated steel doors.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 7100 - Door Hardware.

B. Section 08 8000 – Glazing: Glass for steel frames.

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.

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.

B. Interior Doors, Non-Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
      a. 18 gauge
   2. styles as shown on the drawings.
   3. Core: Polystyrene foam.
   4. Thickness: 1-3/4 inches.
   5. Texture: Smooth faces.
   6. Finish: Factory primed, for field finishing.

C. Interior Doors, Fire-Rated:
   1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
   2. 18 ga.
   3. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C ("positive pressure").
      a. Provide units listed and labeled by UL.
      b. Attach fire rating label to each fire rated unit.
   4. Core: Mineral fiberboard.
   5. Texture: Smooth faces.

6. 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.

D. Interior Door Frames, Fire Rated: Face welded type, seamless with joints filled.
   1. Fire Rating: same as door, labeled.
   2. Finish: Factory primed, for field finishing.

E. Frames for Interior Glazing: Construction and face dimensions to match door frames, and as shown on the drawings.

2.05 ACCESSORY MATERIALS

A. Provide glazing stops for all glazed doors and frames.

B. Glazing: As specified in Section 08 8000.

C. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.

D. 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.

E. 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 3100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access door and frame units, in ceiling location (Hawk's Nest Room 240)

1.02 RELATED REQUIREMENTS

A. Section 09 9000 - Painting and Coating: Field paint finish.

1.03 REFERENCE STANDARDS

A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

B. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

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

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate position of access door units.

D. Samples: Submit one access unit, 30 x 30 inch in size illustrating frame configuration.

E. Manufacturer's Installation Instructions: Indicate installation requirements.

F. Project Record Documents: Record actual locations of all access units.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire rated access doors.
   1. Provide access doors of fire rating equivalent to the fire rated assembly in which they are to be installed.

B. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.

1.06 PROJECT CONDITIONS

A. Coordinate the work with other work requiring access doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Access Doors:
   1. Acudor Products Inc: www.acudor.com.
   2. Karp Associates, Inc: www.karpinc.com.
   3. Milcor Inc: www.milcorinc.com.
   4. Mifab; Product Universal Access Door: www.mifab.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESS DOORS AND PANELS

A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

2.03 ACCESS DOOR UNITS - WALLS AND CEILINGS

A. Door and Frame Units: Formed steel.
   1. Door recessed 5/8" to receive drywall.

2. Door Panels: 20 ga. single thickness steel sheet.
3. Frames: 26 ga. Steel acoustical ceiling tile on all sides.
4. Sizes:
   a. Ceiling: 30 x 30 inches, equal to DW5040, as manufactured by Aucudor.
6. Hardware:
   a. Hinge: 175 degree piano hinge with removable pin.
   b. Lock: Cylinder lock with latch, two keys for each unit.
7. Prime coat with alkyd primer.

2.04 FABRICATION

A. Weld, fill, and grind joints to ensure flush and square unit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings for door and frame are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

END OF SECTION

SECTION 08 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 Resistant Membranes: 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. International Building Code, 2021

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
   5. EFCO Corporation: www.efcocorp.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.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all exterior doors only.

D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all exterior doors only.

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.

END OF SECTION

SECTION 08 5113
ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum single hung windows.

B. Factory glazing.

C. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - Weather Barriers: Perimeter air and vapor seal between window frame and adjacent construction.

B. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.

C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.

C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2004a.

D. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2004.

E. ASTM E 283 - 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.

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 - International Building Code, 2012

1.04 PERFORMANCE REQUIREMENTS

A. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
   1. Design Wind Loads: Comply with requirements of 2012 code.
   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 window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured 6.24 psf pressure differential 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 10 lbf/sq ft.: water application of 5 gal./hr/sq.ft.

E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly.

F. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

G. Forced Entry Resistance: Conform to ASTM F 588 requirements for performance level 10 for all aluminum windows.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, and installation requirements.

C. Samples: Anchors,, fasteners, hardware, finish, and assembled corner sections.

D. Test Reports

1.06 QUALITY ASSURANCE

A. Comply with requirements of AAMA 101 Designation HC 65

B. Manufacturer and Installer: Company specializing in fabrication of residential aluminum windows of types required, with not fewer than three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide ten year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide two year manufacturer warranty against excessive degradation of exterior finish, and defective materials or workmanship.

E. Provide two year installer warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manko Window Systems, Inc., 7035 Series Tilt Sash single hung windows.
   1. Provide fixed and transom units as shown.

2.02 MATERIALS

A. Aluminum Members
   1. Extruded aluminum prime billet 6063-T5 or 6063-T6 alloy for primary components; 6063-T5, 6063-T6, or 6061-T6 for structural components; all meeting the requirements of ASTM B221.
   2. Aluminum sheet alloy 5005 H 32 (for anodic finish), meeting the requirements of ASTM B209.

2.03 MANUFACTURED UNITS

A. Materials
   1. Principal window frame members will be a minimum 0.062" in thickness except at frame sills, which will be 0.094" minimum thickness.
   2. Extruded or formed trim components will be a minimum 0.062" in thickness.

B. Fabrication
   1. Frame depth of 3-1/2" minimum.
   2. Sill must allow for drainage to the exterior and function under both negative and positive pressure.
   3. Frame-to-sash interface shall be designated for sweep seals, to prevent loss of weather-strip contact under positive pressure.
   4. Sash must be tubular and be removable to the interior for maintenance.
   5. Frames are designed for self-mulling (stacking).

C. Glazing
   1. Stop glazed with interior removable stop and gasket.
   2. Standard cavity for 1" infill.
   3. Glass or panel set in structural silicone and heal bead.

2.04 COMPONENTS

A. All steel components including attachment fasteners to be 300 series stainless steel except as noted.

B. Extruded aluminum components 6063-T5 or 6063-T6.

C. Locking handles, cases and strikes to be die cast or stainless steel.

D. Thermoplastic or thermo-set plastic caps, housings and other components to be injection-molded nylon, extruded PVC, or other suitable compound.

E. Hardware:
   1. Balances
      a. Balances must provide a positive lifting force through the full range of sash travel. Sash travel must be limited on oversize units.
      b. When properly adjusted, balances must hold the sash stationary at any open position.
         i. Ultra-Lift TM balance
   2. Locks
      a. White bronze cam action sweep latches; one per meeting rail.
      b. Provide stainless steel strikes.
         i. Automatic spring-loaded head and/or sill locks shall secure sash in closed position.
   3. Lift Handles
      a. Provide integral continuous lift handles on sash.
   4. Limit Stops
      a. Provide jamb-mounted limit stops.

F. Sealants
   1. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
   2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window manufacturer.

G. Glass
   1. Provide in general accordance with Section 08 8000.
   2. Sealed insulated glass shall meet ASTM E774 Class A.

H. Glazing
   1. Provide in general accordance with Section 08 8000
   2. Glazing method shall be in general accordance with the FGMA Glazing Manual for specified glass type, or as approved by the glass fabricator.

I. Glazing Materials
   1. Setting Blocks/Edge Blocking: Provide in sizes and locations recommended by FGMA Glazing Manual.
   2. Back-bedding tapes, expanded cellular glazing tapes, toe beads, heel beads and cap beads shall meet the requirements of applicable specifications cited in AAMA 800.
   3. Glazing gaskets shall be non-shrinking, weather-resistant, and compatible with all materials in contact.
   4. Structural silicone sealant where used shall meet the requirements of ASTM C 1184.
   5. Spacer tape in continuous contact with structural silicone shall be tested for compatibility and approved by the sealant manufacturer for the intended application. Gaskets in continuous contact with structural silicone shall be extruded silicone or compatible material.

J. Steel Components
   1. Provide steel reinforcements as necessary to meet the system performance requirements of 1.02.
   2. Concealed steel anchors and reinforcing shall be factory painted after fabrication with rust-inhibitive primer complying with Federal Specification TT-P-645.

K. Thermal Break Construction:
   1. Frame and sash members must include a thermal break applied in the manufacturer's facility, using concealed low conductance poured-in-place polyurethane in a pre-treated cavity.
   2. After proper curing, the aluminum bridge section must be removed to provide a 1/4" separation between exterior and interior metal surfaces.

L. Weather Stripping:
   1. Sashes shall be double weather-stripped to frame and shall provide an effective pressure-equalization seal at the interior face of the sash.
   2. Securely stake and join at corners. Provide drainage to exterior as necessary.

M. Receptors/Sill Starter:
   1. Provide extruded aluminum receptors to receive windows. as shown on architectural drawings.
   2. Finish to match window frames.

N. Muntins:
   1. Provide muntin grids in configurations as shown on architectural drawings.
   2. Exterior muntin grids shall be applied to main frame in a manner that allows for thermal expansion without compromising grid appearance or glass replacement.
   3. Exterior muntin grids that are adhered to glass surface are not acceptable.
   4. Interior applied flat bar muntin grids that adhere to glass surface are acceptable.
   5. Muntin grid finish to match window frames.

2.05 FABRICATION

A. General:
   1. Finish, fabricate and shop assemble frame and sash members into complete windows under the responsibility of one manufacturer.
   2. No bolts, screws or fastenings to bridge thermal barrier or impair independent frame movement.
   3. Fabricate to allow for thermal movement of materials when subjected to a temperature differential from -30 degrees F to +180 degrees F.

B. Frames:
   1. Cope and mechanically fasten each corner, or miter all corners and mechanically stake over a solid extruded aluminum corner key leaving only hairline joinery, then seal weather tight.

C. Main Sash Ventilator
   1. Miter all corners and mechanically stake over a solid extruded aluminum corner key, leaving only hairline joinery, then seal weather tight.

D. Glass Drainage: (field glazed units only)
   1. Provision shall be made to insure that water will not accumulate and remain in contact with the perimeter area of sealed insulated glass.

E. Tolerances
   1. Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with the Aluminum Standards and Data.

2.06 FINISHES

A. Finish of Aluminum Components
   1. Finish of all exposed areas of aluminum windows and components shall be done in accordance with the appropriate AAMA Voluntary Guide Specification shown below:

Designation	Description	Standard	Color
AAM12C21A44	Electrolytically Deposited – Class I	AAMA 611	Dark Bronze

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install window assembly in accordance with AAMA 101.

C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

E. Install sill and sill end angles.

F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

H. Install perimeter sealant in accordance with requirements specified in Section 07 9005.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 ADJUSTING AND CLEANING

A. Adjust hardware for smooth operation and secure weathertight closure.

B. Remove protective material from factory finished aluminum surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

3.05 SCHEDULE

A. See drawings.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for 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.

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
M..... McKINNEY
N ..... NORTON
R ..... RIXSON
S ..... SARGENT – NO SUBSTITUTIONS

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 Determined

SET 1	Door(s) 100		
Each To Have:			
H	2 ea	Continuous Hinge	780-224 x ETW8 x DBZ
S	2 ea	Exit Devices - Electrified	56 AD8410 x 106/113 x 862 x 10B
N	1 ea	Door Closer	UNI8501 x 695
N	1 ea	Automatic Door Opener	6920- RH – RF1 x 695
N	1 ea	Vestibule switch	675
N	1 ea	Switch Post	577 x 578
SC	1 ea	Power Supply	BPS-24-1

- BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER
- Card Reader by others

SET 2	Door(s) 101		
Each To Have:			
H	2 ea	Continuous Hinge	780-224 x DBZ
S	2 ea	Push / Pull bar	159D
N	1 ea	Door Closer	UNI 8501 x 695
N	1 ea	Automatic Door Opener	6920- RH – RF1 x 695
N	1 ea	Vestibule switch	675
N	1 ea	Switch Post	577 x 578

- BALANCE OF HARDWARE BY ALUMINUM DOOR SUPPLIER

SET 3	Door(s) 121.2		
Each To Have:			
M	2 ea	Hinge	MCK12HD x DH x Clear
S	2 ea	Exit Device	8810 x US32D
N	2 ea	Door Closer	UNI 8501 x 689
S	1 ea	Removable Mull	L980S
H	2 ea	Weatherstrip	891SV (DOW x DOH) Alum
H	1 ea	Drip Cap	810S (DOW + 4") Alum
H	1 ea	Threshold	412S x DW x Alum
H	2 ea	Sweep Strip	750SN x DW x Alum

SET 4		Door(s) 119, 145,	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Mortise Lockset (Storeroom)	8251 x LNL x US26D
N	1 ea	Door Closer	UNI 8501 x 689
H	1 ea	Kickplate	190S 10 x DW x US32D
H	1 ea	Weatherstrip	891SV (DOW x DOH) Alum
H	1 ea	Drip Cap	810S (DOW + 4") Alum
H	1 ea	Threshold	541SV x DW x Alum
H	1 ea	Sweep Strip	750SN x DW x Alum

SET 5		Door(s) 121.1, 200	
Each To Have:			
M	4 ea	Hinge	TA2714 4.5" x 4.5" US26D
M	2 ea	Hinge – Elec	TA2714 ETW 4.5" x 4.5" US26D
S	2 ea	Exit Device	12 56 8813 x ETL x DW x US32D
S	1 ea	Removable Mull	980S x 689
N	2 ea	Door Closer	UNI 8501 x 689
H	2 ea	Kickplate	190S 10 x DW x US32D
H	2 ea	Wall Stop	236W x US32D
SC	1 ea	Power Supply	BPS-24-1
H	2 ea	Silencers	307D

- Card Reader by others

SET 6		Door(s) 102, 105, 106, 109, 110, 113, 114, 117, 118, 141, 138, 137, 134, 133, 130, 129, 126, 125, 201, 204, 205, 208, 209, 212, 213, 216, 217, 223, 224, 227, 228, 231, 232, 235, 236, 239,	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Lockset (Office / Entry)	28-7G05 LL x US26D
N	1 ea	Door Closer	8501 x 689
H	1 ea	Kickplate	190S 10 x DW x US32D
H	1 ea	Automatic Door Bottom	740S x CLR
H	1 ea	Smoke Seal	722S
H	1 ea	Wall Stop	236W x US32D

SET 7		Door(s) 220, 221, 122, 123, 142	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Lockset (Storeroom)	28-7G04 LL x US26D
N	1 ea	Door Closer	8501 x 689
H	1 ea	Kickplate	190S 10 x DW x US32D
H	1 ea	Wall Stop	236W x US32D
H	1 ea	Smoke Seal	722S

SET 8		Door(s) 103.1, 103.2, 107.1, 107.2, 111.1, 111.2, 115.1, 115.2, 127.2, 127.1, 132.2, 132.1, 136.2, 136.1, 140.2, 140.1, 202.1, 202.2, 206.1, 206.2, 210.1, 210.2, 214.1, 214.2, 225.1, 225.2, 229.2, 229.1, 233.1, 233.2, 237.1, 237.2,	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Lockset (Passage)	7U15 LL x US26D
H	1 ea	Wall Stop	236W x US32D
H	3 ea	Silencers	307D

SET 9		Door(s) 104, 108, 112, 116, 120, 124, 128, 131, 135, 139, 203, 207, 211, 215, 218, 222, 226, 230, 234, 238,	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Lockset (Privacy)	7U65 LL x US26D
H	1 ea	Wall Stop	236W x US32D
H	3 ea	Silencers	307D

SET 10		Door(s) 240	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Lockset (Classroom)	28-7G37 LL x US26D
N	1 ea	Door Closer	8501 x 689
H	1 ea	Kickplate	190S 10 x DW x US32D
H	1 ea	Wall Stop	236W x US32D
H	3 ea	Silencers	307D

SET 11		Door(s) 143	
Each To Have:			
M	3 ea	Hinge	TA2714 4.5" x 4.5" US26D
S	1 ea	Lockset (Passage)	7U15 LL x US26D
H	1 ea	Indicator Deadbolt	3216 x US26D
N	1 ea	Door Closer	8501 x 689
H	1 ea	Wall Stop	236W x US32D
H	3 ea	Silencers	307D

Note: Door thresholds and closers must meet ADA requirements.

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.
   1. Glass for aluminum doors and frames
   2. Glass for metal frames

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 – Hollow Metal Doors and Frames

B. Section 08 4313 - Aluminum-Framed Storefronts.

C. Section 08 5113 – Aluminum Windows

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 PRE-INSTALLATION MEETING

A. Communicate one week before starting work of this section.

1.09 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.

1.10 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, Flat Glass North America Inc., www.afgglass.com
   5. Approved Equal

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.
      c. Other areas required by code.

D. High Performance Glass.
   1. 1" Insulating units.
   2. Exterior Lite: 1/4" (6mm) AGC Solarshield Grey with Ti-AC40 Low E coating on #2 surface.
   3. Interior Lite: 1/4" (6mm) AGC Clear
   4. Overall Unit Thickness: 1" nominal
   5. Interspace Content: Air

6. Visible Light Transmittance: 32 percent minimum
7. Winter Nighttime U Factor: .29 maximum
8. Summer Daytime U-Factor: .28 maximum
9. Solar Heat Gain Coefficient: .24 percent maximum
10. Low-E Coating: Sputtered on second surface
11. Outdoor Visible Reflectance: 6 percent maximum

2.02 SEALED INSULATING GLASS MATERIALS

A. Insulated Glass Units: 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.
   5. Provide hermetically sealed insulating glass units with dehydrated air space, dual sealed with a primary seal of polyisobutylene (PIB), or thermo plastic spacer (TPS) and a secondary seal of silicone or an organic sealant depending on the application.
   6. US Requirements:
      a. Insulating glass units are certified through the Insulating Glass Certification Council (IGCC) to either ASTM E774, or to ASTM E2190, or both.
      b. Annealed float glass shall comply with ASTM C1036, Type I, Class 1 (clear), Class 2 (tinted) Quality Q3.
      c. Heat strengthened float glass shall comply ASTM C1048, Type I, (Class 1 (clear), Class 2 (tinted), Quality Q3, Kind HS.
      d. Tempered float glass shall comply with ASTM C1048, Type I, Class 1 (clear), Class 2 (tinted), Quality Q3, Kind FT.
   7. Glass shall be annealed, heat-strengthened or tempered as required by codes, or as required to meet thermal stress and wind loads.

B. Edge Seal Construction: Aluminum, bent and soldered corners.

C. 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
   5. Approved equal.

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

D. Structural Silicone Sealant
   1. The glazing installer is responsible for selecting and contacting the silicone manufacturer to determine which type of silicone is to be submitted for adhesion and compatibility testing.
   2. The silicone sealant shall not be applied to the curtain wall manufacturer's products without the approval of the silicone manufacturer and until all required testing is completed and detailed application instructions have been delivered by the silicone manufacturer.

3. The glass supplier must be made aware that their glass will be used in a structural silicone glazed application. The application must be used by the glass supplier prior to glazing.

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.
      c. Approved equal.

D. Exterior Glass Weather Seal: Sealant to be a type as recommended by the manufacturer of the structural sealant being used for this project. Sealant must be applied per the sealant manufacturer's recommendations. Weather seal must adhere to the exterior gasket materials.

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"
   1. Shown on drawings as Insulating Glass.
      a. Glass to be 1 inch thick insulating units.

b. Inner Layer: ¼ inch clear float glass, annealed.
c. Outer Layer: ¼ inch solar grey, float type, heat strengthened.
d. Tempered safety glass where required by code.

B. Fixed Glass at Aluminum Windows
1. Shown on drawings as Insulating Glass.
a. Glass to be 1 inch thick insulating units.
b. Inner Layer: ¼ inch clear glass, tempered.
c. Outer Layer: ¼ inch clear glass, tempered.

C. Exterior Doors: Aluminum doors to be glazed same as indicated for aluminum frames and curtain wall frames.

D. Fixed glass at interior aluminum frames and doors:
1. ¼ inch clear float glass annealed.
2. Tempered safety glass where required by code.

E. Fixed glass at interior HMF:
1. ¼ inch clear float glass annealed.
2. Tempered safety glass where required by code.

F. See schedule 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. Gypsum Board Ceilings: Non-rated.
C. Gypsum Board Ceilings: Fire-Rated.
D. Gypsum Board Walls: Non-rated.
E. Gypsum Board walls: Fire-rated.
F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: For exterior metal studs.
B. Section 06 1000 - Rough Carpentry: Wood blocking for support of wall-mounted equipment.
C. Section 06 1643 – Gypsum Sheathing: Exterior wall sheathing.
D. Section 07 2116 - Blanket Insulation: Exterior and interior wall insulation.
E. 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.
I. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

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. P540 - 1 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 1/2" and 2"; furring channels; 18 gauge.

F. Framing Schedule
   1. Exterior Walls: See Section 05 4000 - Cold Form Metal Framing
   2. Interior Partitions: (and misc. framing)
      a. 2 ½", 6", 8", 12" 22 gauge galvanized studs
      b. 2 ½", 6", 8", 12" 18 gauge galvanized runners
   3. Floor Joists/Framing at Platforms:
      a. 8" 18 gauge galvanized joists.

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. Type X: Fire resistant, UL or WH rated.
      a. Application: Where required for fire-rated assemblies, unless otherwise indicated.
      b. Thickness: 5/8 inch
      c. Edges: Tapered.
   3. 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

2.04 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.

D. Adhesive for Multi-Layer Partitions: USG Durbond joint compound or USG ready mix joint compound for multi-layer partitions.

E. Expansion/control joints: Zinc control joint No. 093

F. Edge Trim: Clark Dietrich: Metal U-Trim #200-A. Do **NOT** use J-Trim like series by Clark Dietrich.

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.
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. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of listing authority.

D. 1 Hr. Rated Fire Barrier: UL Des. U419
1. 1 layer of 5/8" gypsum board applied vertically to metal studs each face.

2. Attached with 1" long Type S screws at 8" o.c. along vertical edges and 12" o.c. in the field.
3. Stagger joints in gypsum board on opposite sides of assembly.
4. Finish gypsum board joints with joint tape and 2 layers of joint compound.

E. 1 Hr. Rated Fire Roof/Ceiling Assembly UL Des. P540
1. Use 7/8" Hat Channels
2. One layer Type "X" Gypsum Board
3. Screw fasten hat channels perpendicular to lower chord of light Guage steel trusses spaced a maximum 48" o.c.

F. The contractor is to stencil all rated walls above decorative ceiling in accordance with the Arkansas Fire Prevention Code, current edition.

G. Installation on Metal Framing: Use screws for attachment of all gypsum board.

H. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

backer board at soffits perpendicular to framing; end joints to be over framing member.

3.05 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.
1. Clark Dietrich: Metal U-Trim #200 A. Do **NOT** use J-Trim like 400 series by Clark Dietrich.

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.

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.

B. Level 1: Fire rated walls, areas above finished ceilings, whether or not accessible in the completed construction.

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 0000 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.

B. Section 23 0010 - Air Inlets and Outlets: Air diffusion devices in ceiling.

C. Section 26 5100 - 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. Attachment Devices: In accordance with the International Building Code, Section 1621 for Category D.

C. Wire for Hangers and Ties: In accordance with the International Building Code, Section 1621.

D. Wall Moldings: In accordance with the International Building Code, Section 1621 for Category D or method as described in ESR-1308.

1. Nominal 7/8 inch x 7/8 inch hemmed, pre-finished angle molding.

E. 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per STM AW568 – used to join main beam or cross tee to wall molding.

F. Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint.

G. Seismic Joint Clip – Main Beam, 1 inch x 4 inches, commercial quality cold rolled hot dipped galvanized steel per ASTM A 568, chemical cleansed.

H. Touch-up Paint: Type and color to match acoustical and grid units.

I. 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 D.

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 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

B. Stair treads, risers, and landings.

C. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 – Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

1.03 REFERENCE STANDARDS

A. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2004.

B. ASTM F 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2005.

C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2010)e1.

D. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2002.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect roll materials from damage by storing on end.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 MATERIALS - BASE

A. Resilient Base: ASTM F1861, Type TP, rubber; top set Style B, Cove, and as follows:
   1. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch thick.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: To be selected.
   7. Accessories: Premolded external corners and end stops.

8. Manufacturers:
   a. Armstrong Commercial Flooring, www.armstrong.com
   b. Johnsonite, Inc.: www.johnsonite.com.
   c. Roppe Corp.: www.roppe.com.

2.02 MATERIALS – STAIR COVERING

A. Stair Treads: Rubber; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch deep.

1. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.

2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.

3. Nominal Thickness: 0.1875 inch.

4. Nosing: Square.

5. Style: #92 low profile raised circular design.

6. Color: Solid.

7. Manufactures:

   a. BurkeMercer Flooring Products: www.burkemercer.com.

   b. Johnsonite, Inc.: www.johnsonite.com.

   c. Roppe Corp: www.roppe.com.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives and Seaming Materials: Waterproof; types recommended by flooring manufacturer.

C. Moldings and Edge Strips: Rubber.
   1. See details on drawings for type of transition strips.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive resilient flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Verify that sub-floor surfaces are dust-free and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F 710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.

C. Prohibit traffic until filler is cured.

D. Clean substrate.

E. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.04 INSTALLATION – STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.

B. Install risers configured tightly to stair profile.

C. Adhere over entire surface. Fit accurately and securely: Trim tread as required for tight fit at nosing.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's instructions.

C. Clean, seal, and wax resilient flooring products in accordance with manufacturer's instructions.

3.06 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.07 SCHEDULE

A. See Finish Schedule on the drawings.

END OF SECTION

SECTION 09 6700
EPOXY FLOORING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Epoxy Flooring

B. Epoxy Cove Base

C. Accessories

1.02 SUBMITTALS

A. Submit manufacturer's data sheets and product technical information.

B. Submit samples for color selection.

C. Prior to commencing work at architect's discretion, a 4' x 4' mockup must be installed on jobsite to show color, thickness, and texture before contract is to be awarded to epoxy flooring contractor and when approved, this will serve as the standard for the entire project. The person who installed the mockup must be the lead man for the duration of the job.

D. Submit applicator's experience qualifications as required in 1.03, Quality Assurance below.

1.03 QUALITY ASSURANCE

A. All materials must be recommended and manufactured by a single supplier to insure compatibility and proper chemical and mechanical bond.

B. Surfacing shall be applied by a surfacing applicator approved by the Architect, with a minimum of seven (7) years experience installing the brand of surfacing in similar size and function projects. A list of ten (10) completed projects using the specified materials must submitted proving seven (7) years experience by the lead mechanic.

C. Surfacing applicator shall provide to the architect a completed list of jobs including the names of the Architect, General Contractor, and Owner, telephone numbers of all concerned, materials used, quantity installed and date completed on similar projects.

D. Surfacing applicator must provide a written joint guarantee for materials and workmanship between applicator and surfacing manufacturer for one (1) year.

E. Surfacing applicator or manufacturer seeking approval of products other than what is specified must supply samples, full product information, technical data with specifications, and certification from an independent testing laboratory that the product being submitted for approval meets all requirements of the performance properties specified within this specification, installation instructions and comply with the above quality assurances in writing.

1.04 PRODUCT STORAGE AND ENVIRONMENTAL CONDITIONS

A. Material temperatures shall be a minimum of 60 F before use.

B. Work on seamless flooring shall not commence until the building can be maintained at a minimum temperature of 60 F for 48 hours before, during and 48 hours after application. Areas shall also be broom clean and reasonably dust free and shall have adequately controlled ventilation with bright, uniform lighting.

1.05 PROJECT CONDITIONS

A. Before commencing work, ensure environmental and site conditions are suitable for application and curing.

B. Surfaces shall be acceptable in accordance with flooring manufacturer's recommendations.

C. Notify Architect and Contractor in writing of unsuitable surfaces and conditions. Commencement of work shall imply acceptance of surfaces and working conditions.

1.06 PROTECTION

A. Protect adjacent surfaces from damage resulting from work of this trade. If necessary, mask and/or cover adjacent surfaces, fixtures, cabinet work, equipment, etc. by suitable means.

1.07 WARRANTY

A. Applicator shall notify manufacturer of project requirements before bidding. An officer of the manufacturing company shall provide written statement before bidding; to the Architect, that they accept single source warranty for entire installation including labor for one year. By agreeing to sign warranty and supply product, manufacturer waives all rights of sellers' liability of warranty and limitation. Warranty shall include removal and replacement if proven defective. Defective items are, but not limited to debonding, regionalized discoloration, excessive wear and staining bodily fluids. Non-acceptance of above by manufacturer is grounds for rejection of product.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Flooring to be equal to "Cremona TG" using Grade 11 aggregate as supplied by Desco Coatings, Inc., (800) 426-4164.

2.02 SYSTEM DESCRIPTION

A. A 3/16" thick, seamless, trowel-applied, 100% solids consisting of a combination of epoxies and multi-colored ceramic aggregates. **Broadcast systems are not accepted.**

B. Provide 4" high base with 1" radius cove as scheduled on the drawings.

C. Binder and all successive grout and top coats shall be 100% solids clear/epoxy resin. Ceramic coated quartz aggregates as supplied by Desco Coatings are to be used to achieve all color. No pigmented epoxy base or top coats allowed.

2.03 SURFACE TEXTURE

A. Texture to be selected by architect.

2.04 MATERIAL PHYSICAL PROPERTIES

	TYPE TEST	TEST METHOD	TYPICAL VALUE
1	COMPRESSIVE STRENGTH	ASTM C-579	10,700 PSI (73.8 MPA)
2	TENSILE STRENGTH	ASTM D-638-91	6,800 PSI (46.9 MPA)
3	IMPACT RESISTANCE	GARDNER IMPACT TESTER	>160 IN./LB.
4	ABRASION RESISTANCE	ASTM D-4060	0.085 GM
5	FLAMMABILITY	ASTM D-635	SELF EXTINGUISHING
6	WATER ABSORPTION	ASTM C-413-88	0.3%
7	COEFFICIENT OF THERMAL EXPANSION	ASTM C-531-90	2.3 X 10 (5TH POWER) IN/IN/DEGREES F
8	FLEXURAL STRENGTH	ASTM C-580-90	3,520 PSI (24.3 MPA)
9	CURING SHRINKAGE	ASTM D-531-90	5.0 X 10 (4TH POWER) IN/IN
10	SHORE D HARDNESS	ASTM D-2240-91	80

PART 3 - EXECUTION

3.01 FLOORING PREPARATION

A. Surface must be clean, sound and dry.

B. Effectively remove concrete laitance on accessible floor surfaces by mechanical shot blast. Acid etching is not acceptable.

3.02 FLOORING APPLICATION

A. Epoxy flooring to be installed prior to wall partitions. Epoxy flooring to be continuous under all partitions.

B. Apply flooring in accordance with manufacturer's printed instructions, employing lead mechanic qualified under the quality assurance portion of this specification, using equipment specifically designed for this purpose.

C. Minimums: Primer coat as recommended by Desco. Trowel body coat to be a 3 part mix of resin, activation, and aggregates. Grout coats (minimum of two) to fill porosity of body coat. If all porosity is not filled after two coats, a third is required. Topcoat as recommended by Desco with a medium sheen and stipple finish.

D. Thickness: Desco Quartz Cremond TG is a hand troweled Grade 11 Desco quartz aggregate with 20% of grade 28 as a filler. The system should be hand troweled to 3/16" thickness over epoxy primer.

E. Install integral cove base to height of 6" with ¼" radius cove. See finish schedule on the drawings.
   1. Trowel apply vertical cove base.
   2. Hand sand cove base.
   3. Apply three coats of resin to assure a smooth surface and cove.
   4. Do not allow resin to puddle in cove.

F. Finished work shall match approved samples; be uniform in thickness, sheen, color, pattern, and texture; and be free from defects detrimental to performance.

3.03 PROTECTION

A. After completion of flooring the General Contractor shall protect flooring from damage by other trades.

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.

E. See Schedule - Surfaces to be Finished, at end of Section.

1.02 RELATED REQUIREMENTS

A. Section 04 2000 – Unit Masonry

B. Section 05 1200 – Structural Steel Framing

C. Section 05 5000 – Metal Fabrications: Shop primed items.

D. Section 05 5100 – Metal Stairs: Shop primed items.

E. Section 05 5213 – Pipe and Tube Railings: Shop primed items.

F. Section 06 2000 – Finish Carpentry

G. Section 08 1113 – Hollow Metal Doors and Frames

H. Section 09 2116 – Gypsum Board Assemblies

I. Section 09 9656 – Epoxy Coatings

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. Sherwin-Williams Paints
   2. Pratt & Lambert
   3. PPG Paints
   4. Farrell-Calhoun
   5. Benjamin Moore
   6. 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. SW Kem Kromik Metal Primer
   2. Gloss: Two coats of alkyd enamel; SW Industrial Enamel, Series B54Z.

B. Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Gloss: Two coats of alkyd enamel; SW Industrial Enamel, Series B 54Z.

C. Galvanized Metals, Alkyd, 3 Coat:
   1. One coat galvanize primer.
   2. Gloss: Two coats of alkyd enamel; SW Industrial Enamel B54Z.

2.04 PAINT SYSTEMS - INTERIOR

A. Wood, Opaque, Latex, 3 Coat:
   1. One coat of latex primer sealer. SW Preprite Classic Latex Primer
   2. Semi-gloss: Two coats of latex enamel; SW Proclassic, Waterborne Acrylic Satin, Series B20.

B. Wood, Transparent, Varnish, Stain:
   1. One coat of stain; SW Wood Classics Oil Stain, Series A 49-200..
   2. One coat sealer; SW Wood Classics Sanding Sealer, Series B26V43.
   3. Satin: Two coats of varnish; SW Wood Classics Oil Varnish, Series A66-300.

C. Concrete Block, Opaque, Acrylic, 3 Coat:
   1. One coat of block filler; SW Preprite or equal.
   2. Semi-gloss: Two coats of Benjamin Moore "Scuff-X", or equal.

D. Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer. SW Kem Kromik Metal Primer
   2. Gloss: Two coats of alkyd enamel; SW Industrial Enamel, Series B54Z.

E. Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with alkyd primer.
   2. Gloss: Two coats of alkyd enamel; SW Industrial Enamel, Series B54Z.

F. Exposed Metal Structure: (at gym and entry/admin)
   1. One coat of SW Kem Kromick Metal Primer if structure unprimed.
   2. One coat of Super Save-Lite Dry Fall, semi-gloss.

G. Gypsum Board, Acrylic, 3 Coat:
   1. One coat of primer sealer SW Preprite Classic Latex Wall Primer or equal; mix block filler to provide slight texture.
   2. Semi-gloss: Two coats of Benjamin Moore "Scuff-X", or equal.

H. Stenciling of Fire Rated Partitions:
   1. Painting contractor is to paint/stencil 2 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". Indicate rating. Verify with Architect for exact verbiage.

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 Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

L. 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 Concrete Block: Finish all surfaces exposed to view.

B. Gypsum Board: Finish all surfaces exposed to view.

C. Wood: Finish all surfaces exposed to view.

D. Steel Doors and Frames: All surfaces.

E. Steel Fabrications: Finish all surfaces exposed to view.

F. Galvanized Steel: Finish all surfaces exposed to view.

G. Shop-Primed Metal Items: Finish all surfaces exposed to view.
   1. Finish the following items:
      a. Exposed surfaces of lintels.
H. Pipe and Duct Insulation Jackets: Finish all surfaces exposed to view.
I. Exposed steel, pipe railings, metal stairs, and all exposed metal.
J. Paint all items where ceiling is "exposed to structure above", unless noted otherwise.
K. Exposed Ductwork: Paint exposed surfaces.

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.

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. 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: 16" x 24"

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 1453
HANDICAPPED SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Handicapped parking signs as shown and detailed on the drawings.

B. One sign is required for each handicapped parking space.

1.02 REFERENCES

A. ATBCB ADAAG – American with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board.

1.03 SUBMITTALS

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

B. Manufacturers data: Provide manufacturer's data on sign layout, colors, and sign materials.

1.04 REGULATORY REQUIREMENTS

A. Signs must be fabricated and installed per ATBCB ADAAG standards.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sign: .080" thick steel, screen printed sign as shown on the drawings.

B. Post: 1 ¾" X 1 ¾" X 104"

PART 3 EXECUTION

3.01 INSTALLATION

A. Sign to be fastened to steel tube with 2-1/4" round head bolts.

B. Sign to be free of nick and edge burrs.

C. Sign Colors: To be green border and legend and blue/white international symbol of accessibility equal to R7-8 from the Manual of Uniform Traffic Control Devices.

D. Provide cap at top of sign pipe.

E. Provide additional "van accessible" sign at each pair of handicapped parking spaces as shown on the drawings.

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 2113.19 - Plastic Toilet Compartments.

1.03 REFERENCES

A. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board; 2004.

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; 2005.

C. ASTM A 554 - Standard Specification for Welded Stainless Steel Mechanical Tubing; 2003.

D. ASTM C 1036 - Standard Specification for Flat Glass; 2001.

E. ASTM F 446 - Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area; 1985 (Reapproved 2004).

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.

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. Soap Dispenser, Wall-Mounted: Model B-2111, Bobrick

D. Paper Towel Dispenser: Model B-4262, Bobrick

E. Mop Holder: Model B-223 x 24", Bobrick

F. Folding Shower Seat: Model B5181, Bobrick

G. Shower Curtain: Model B-204-2 (42")
   1. Provide B-204-3 curtain with 12, B-204-1 curtain hooks

H. Shower Rods: Model B6107 x length required; Bobrick

I. Towel Hook: Model B-6777; Bobrick

J. Stainless Steel Shelf: Model B-295; Bobrick

2.04 MIRRORS

A. Mirror: Model B-290; Bobrick
   1. Frame: Angle, Type 304 stainless
   2. Mirror: Plate glass
   3. Size: As indicated on drawings
   4. Finish: No. 4 satin stainless steel

B. Mirror with Shelf: Model B-166; Bobrick
   1. Frame: Angle
   2. Mirror: Plate glass
   3. Shelf: Type 304, 18 gauge stainless steel with satin finish
   4. Size: as indicated on drawings
   5. Finish: No. 4 Satin Stainless Steel

C. 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.

D. Plate Glass Mirror: 1/4 inch thick polished plate glass, ASTM C1036, 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 and B-6897; 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.

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 RESPONSIBLE FOR VERIFYING QUANTITIES FROM PLANS)

A. Mech/Janitorial 142 to have:

1. 1 Mop Hanger (MH-1)

B. Mech/Janitorial 220 to have:

1. 1 Mop Hanger (MH-1)

C. Typical Washroom to have:

1. 1 Toilet Paper Holder (TPD-1)
2. 1 Robe Hook (RH-2)
3. 1 Shower Curtain and Rod (SCR-1)
4. 1 Stainless Steel Shelf (SH-1)
5. 2 Mirror with Shelf (MR-2)

D. Typical ADA Washroom to have:

1. 1 Toilet Paper Holder (TPD-1)
2. 1 Mirror (MR-1)
3. 1 Stainless Steel Shelf (SH-1)
4. 1 Folding Shower Seat (SS-1)
5. 1 Robe Hook (RH-1)
6. 1 Grab Bar – 42" x 54"L (GB-1)
7. 2 Grab Bars – 18"L (GB-2)
8. 1 Grab Bar – 18" x 30" L (GB-5)
9. 1 Shower Curtain and Rod (SCR-1)

E. Toilet 143 to have:

1. 1 Toilet Paper Holder (TPD-1)
2. 1 Mirror (MR-1)
3. 1 Soap Dispenser (SD-1)
4. 1 Towel Dispenser (TD-1)
5. 1 Grab Bar – 42" x 54"L (GB-1)
6. 1 Grab Bar – 18"L (GB-2)

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 (2) Knox-box cabinets 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.

C. Vandal Resistant fire extinguishers and cabinets

1.02 REFERENCE STANDARDS

A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; 2002.

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:

B. Fire Extinguishers, 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. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. 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 aluminum; mill finish.

B. Cabinet Configuration: Recessed type and Semi-Recessed
   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. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

E. Weld, fill, and grind components smooth.

F. Finish of Cabinet Exterior Trim and Door: Bronze (BZ) / Aluminum / Stainless Steel; See schedule.

G. Finish of Cabinet Interior: White enamel.

H. J.L. Industries: (F.E.C.) "Larsen's" Model "AL-2409-6R" with black lettering
   1. Semi-Recessed
   2. Door Material: Aluminum (AL)
   3. Door Style: Solid
   4. Die Cut Lettering: Black (vertical)

I. J.L. Industries: (R.F.E.C.) "Larsen's" Model "O-2409 Occult Series" with black lettering
   1. Fully Recessed
   2. Provide Fire-Rated option on all extinguisher cabinets located in rated wall assemblies.
   3. Door Material: Bronze (BZ)
   4. Door Style: Solid
   5. Die Cut Lettering: Black (vertical)

J. J.L. Industries: (D.F.E.C.) "Larsen's" Model "DEC SS 2409-R4" with black lettering
   1. Vandal Resistant
   2. Semi-Recessed
   3. Door Material: Stainless Steel
   4. Door Style: Solid
   5. Die Cut Lettering: Black (vertical)

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 (CONTRACTOR RESPONSIBLE FOR VERIFYING QUANTITIES FROM PLANS)

A. Provide fire extinguishers and cabinets located on the drawings and shown as "F.E.C." (Semi-Recessed Cabinet)

B. Provide fire extinguishers and cabinets located on the drawings and shown as "R.F.E.C." (Fully-Recessed Cabinet)

C. Provide fire extinguishers and cabinets located on the drawings and shown as "D.F.E.C." (Vandal Resistant Detention Cabinet)

D. Provide fire extinguishers with standard wall bracket located on the drawings and shown as "F.E."

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 14

CONVEYING EQUIPMENT

SECTION 14 4200
SHAFTWAY VERTICAL PLATFORM WHEELCHAIR LIFT

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Vertical platform wheelchair lift installed within shaftway.

1.02 RELATED SECTIONS

A. Section 03 3000 – Cast-In-Place Concrete: Concrete shaftway floor and anchor placement.

B. Section 04 2000 – Unit Masonry: Masonry shaftway walls and anchor placement.

C. Section 06 1000 – Rough Carpentry: Blocking in framed construction for lift attachment.

D. Section 26 2717 – Equipment Wiring: Electrical power service and wiring connections.

E. Section 26 5000 – Common Work Results for Electrical: Lighting and wiring connections at top of shaft.

1.03 REFERENCES

A. ASME A17.1 – Safety Code for Elevators and Escalators.

B. ASME A17.5 – Elevator and Escalator Electrical Equipment.

C. ASME A18.1 – Safety Standard for Platform Lifts and Stairway Chairlifts.

D. CSA B44 – Safety Code for Elevators and Escalators.

E. CSA B355 – Lifts for Persons with Physical Disabilities.

F. ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities.

G. NFPA 70 – National Electric Code.

H. CSA – National Electric Code.

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. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
2. Include complete description of performance and operating characteristics.
3. Show maximum and average power demands.

C. Shop Drawings:

1. Show typical details of assembly, erection and anchorage.
2. Include wiring diagrams for power, control, and signal systems.
3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.

D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finished product specified, two samples, minimum size 1-3/4" x 2-1/4", representing actual product, color, and patterns.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum 20 years experience in manufacturing of vertical platform wheelchair lifts, with evidence of experience with similar installations of type specified.

B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

1.06 REGULATORY REQUIREMENTS

A. Provide platform lifts in compliance with:
   1. ASME A18.1 – Safety Standard for platform Lifts and Stairway Chairlifts.
   2. ASME A17.1 – Safety Code for Elevators and Escalators.
   3. ASME A17.5 – Elevator and Escalator Electrical Equipment.
   4. NFPA 70 – National Electric Code.

B. Provide platform lifts in compliance with:
   1. CSA B355 – Lifts for Persons with Physical Disabilities.
   2. CSA B44.1/ASME A17.5 – Elevator and Escalator Electrical Equipment.
   3. CSA – National Electric Code.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.08 PROJECT CONDITIONS

A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.09 WARRANTY

A. Warranty: Manufacturer shall warrant the wheelchair lift materials and factory workmanship for two years following completion of installation.

B. Extended Warranty: Provide an extended manufacturer's warranty for the entire warranty period covering the wheelchair lift materials and factory workmanship for the following additional extended period beyond the initial two-year warranty. Preventive Maintenance Agreement required.
   1. Five additional years.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Garaventa Lift; Blaine, WA; www.garaventalift.com.
   1. Used for basis of specification.

B. Ascension; Tuscon, AZ; www.ascension-lift.com.

C. Or equal.

2.02 SHAFTWAY VERTICAL WHEELCHAIR LIFT

A. Capacity: 750 lbs (340 kg) rated capacity.

B. Mast Height:
   1. Model GVL SW-168; 171 inches maximum lifting height, using hydraulic drive, only.

C. Nominal Clear Platform Dimensions:
   1. Standard: 39 inches (992 mm) by 54 inches (1370 mm).

D. Platform Configuration:
   1. Straight Through Entry/Exit: Front and rear openings.

E. Landing Openings:
   1. Lower Landing: Door.
   2. Upper Landing: Door.

F. Door Construction:
   1. Fire Rated Doors: 1 hour B label rating. Pre-hung, constructed of 16 gauge (1.5 mm) steel, with a vision panel, delayed action door closer, pull handle and integrated interlock. Doors mount flush to the inside wall of the shaftway.
   2. Door Width:
      a. Lower Landing: 35-5/8 inches.
      b. Upper Landing: 35-5/8 inches.

G. Lift Components:
   1. Machine Tower: Extruded aluminum.
   2. Base Frame: Structural steel tubing.
   3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet. Aluminum extrusion tube frame.

H. Base Mounting and Access to Lift at Lower Landing:
   1. Pit Mount: Lift to be mounted in pit with dimensions to meet manufacturer's requirements for the platform size specified. Pit construction shall be in accordance to Section 03 3000.

I. Drive Mast Side Wall Panels: Provide 16 gauge (1.5 mm) galvanized panels and mounting hardware to cover the void between both sides of the mast and the side of the shaftway. Panels to cover the front and top of the void area to the height of the top surface of the drive mast.

J. Hydraulic Drive:
   1. Drive Type: Chain hydraulic.
   2. Emergency Operation: Manual device to lower platform and auxiliary battery power to raise or lower platform.
   3. Safety Devices:
      a. Slack chain safety device.
      b. Shoring device.
   4. Travel Speed: 17 fpm (5.2m/minute).
   5. Motor: 3.0 hp (2.2 kW); 24 volts DC.
   6. Power Supply:
      a. 120 VAC single phase; 60 Hz on a dedicated 15-amp circuit.

K. Platform Controls: 24 VDC control circuit with the following fetures:
   1. Direction Control: Continuous pressure rocker switch.
   2. Keyed operation.
   3. Arrival Gong and Digital Floor Display.

L. Call Station Controls: 24 VDC control circuit with the following features:
   1. Direction Control: Continuous pressure switches.
   2. Keyed operation.
   3. Call Station Mounting:
      a. Lower: Wall mounted recessed.

b. Upper: Wall mounted recessed.

N. Safety Devices and Features:
1. Grounded electrical system with upper, lower, and final limit switches.
2. At all landings a solenoid activated interlock shall electrically monitor that the door is in the closed position and the lock is engaged before lift can move from landing.
3. Pit stop switch mounted on mast wall.
4. Electrical disconnect shall shut off power to the lift.

O. Finishes:
1. Extruded aluminum electrostatically applied baked powder finish semi matte Silver Moon.
2. Ferrous Components: Electrostatically applied baked powder finish, semi matte.
a. Color: Silver Moon
3. Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. Verify shaft and machine space are of correct size and within tolerances.
C. Verify required landings and openings are of correct size and within tolerances.
D. Verify electrical rough-in is at correct location.
E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install platform lifts in accordance with applicable regulatory requirements including ASME A17.1, ASME A18.1 and the manufacturer's instructions.
B. Install platform lifts in accordance with applicable regulatory requirements including CSA B355, and manufacturer's instructions.
C. Install system components and connect to building utilities.
D. Accommodate equipment in space indicated.
E. Startup equipment in accordance with manufacturer's instructions.
F. Adjust for Smooth Operation.

3.04 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A17.1 or A18.1 and as required by authorities having jurisdiction.
B. Perform tests in compliance with CSA B355 and required by authorities having jurisdiction.
C. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.05 PROTECTION

A. Protect installed products until completion of the project.

B. Touch up, repair or replace damaged products before Substantial Completion.

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. Removal of topsoil.

B. Rough grading the site.

C. 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.

3.04 PROTECTION

A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2316.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED SECTIONS

A. Section 31 2200 - Grading: Site grading.
B. Section 31 2316 - Excavation: Building and foundation excavating.
C. Section 31 2323 - Fill: Backfilling at building and foundations.

1.03 REFERENCES

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; 2001 (2004).
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)); 2000a.
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)); 2002.
E. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
F. 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 01330 - Administrative Requirements, 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 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.
C. Verify that survey bench marks and intended elevations for the Work are as indicated.
D. Protect plants, lawns, rock outcroppings, and other features to remain.
E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

B. Structural Fill - Fill Type Class 7: Conforming to State of Arkansas Highway Department standard.
C. Concrete for Fill: Flowable Fill; maximum compressive strength of 1000 psi.
D. Granular Fill: Coarse aggregate, conforming to State of Arkansas Highway Department standard.
E. Sand: Conforming to State of Arkansas Highway Department standard.
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.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.
B. Locate, identify, and protect utilities that remain and protect from damage.
C. Notify utility company to remove and relocate utilities.
D. See Section 31 2200 for additional requirements.

3.02 TRENCHING

A. Notify Brackett-Krennerich Architects of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
C. Do not interfere with 45 degree bearing splay of foundations.
D. Cut trenches wide enough to allow inspection of installed utilities.
E. Hand trim excavations. Remove loose matter.
F. Remove excavated material that is unsuitable for re-use from site. Unsuitable material to be disposed of off campus by the contractor.
G. Remove excess excavated material from site. Suitable material to be stockpiled on campus at a location to be determined by the owner.

3.03 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.04 BACKFILLING

A. Fill up to subgrade elevations unless otherwise indicated.
B. Employ a placement method that does not disturb or damage other work.
C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
D. Maintain optimum moisture content of fill materials to attain required compaction density.
E. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
F. Correct areas that are over-excavated.
    1. Thrust bearing surfaces: Fill with concrete.
    2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
G. Compaction Density Unless Otherwise Specified or Indicated:
    1. Under paving, slabs-on-grade, and similar construction: Flowable Fill to sub-grade plus

Structural Fill base per details for asphalt and concrete paving.

2. At other locations: General Fill at 95 percent of maximum dry density.

H. Reshape and re-compact fills subjected to vehicular traffic.

3.05 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, and Duct Bank and Storm Drainage Piping:

1. Bedding: Use Fill Type 3/4" minus crushed limestone.
2. Cover with general fill.
3. Fill up to subgrade elevation.
4. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

C. Utlity Piping, Conduits, and Storm Drainage Piping under driveways, parking lots, sidewalks or other paved surfaces:

1. Bedding: Use Fill Type 3/4" minus crushed limestone.
2. Cover with 3/4" minus crushed limestone to 12 inches above the pipe or conduit.
3. Fill up to subgrade elevation. Use structural fill or flowable fill (contractor is responsible for all future settlement and/or damage to paved surfaces).

3.06 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.07 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.

3.08 CLEAN-UP

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 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 01 2100 - Allowances.

B. Section 01 2200 - Unit Prices.

C. Section 31 2200 - Grading: Removal and handling of soil to be re-used.

D. Section 31 2200 - Grading: Site grading.

1.03 UNIT PRICES

A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for earthwork.

B. Structural Fill: Applies to Unit Price
   1. Measurement Method: By the cubic yard.
   2. Includes: Excavating existing soil, disposal of existing soil, providing new material as specified, placing and compaction of new material.
   3. Unit prices will be used for any undercut and fill that is required to complete the work not included in the original bid documents. **No additional work is to be completed under this unit price provision unless approved by architect.**

1.04 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.

1.05 DEFINITIONS

A. Finish Grade Elevations: indicated on drawings.

B. Subgrade Elevations: 6 inches below finish grade elevations indicated on drawings unless otherwise indicated.

1.06 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.

1.07 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.

1.08 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.

1.09 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 CUT AND FILL

A. Site may require cut and fill.

B. Contractor shall assume that potential undercutting and fill may be required below the slab on grade portion of the building based on recommendations found in the geotechnical report. Therefore, a price is to be included in the base bid for 900 cubic yards total of undercut and fill; this is to be included in the base bid.

C. No undercut is to be completed without prior written approval from the architect.

3.04 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.

3.05 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.

3.06 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.

3.07 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.

3.08 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 1216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single course bituminous concrete paving. (Light Duty - See Plans)

1.02 REFERENCE STANDARDS

A. ASTM D 946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 1982 (Reapproved 2005).

B. Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, 1993.

1.03 RELATED REQUIREMENTS

A. Section 31 2200 - Grading: Preparation of site for paving and base.

B. Section 31 2323 - Fill: Compacted subgrade for paving.

C. Section 32 1124 - Aggregate Base Courses: Steel Slag

D. Section 32 1723.13 - Painted Pavement Markings.

1.04 SUBMITTALS

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

B. Submit design mixes of all paving for architect's review and approval.

1.05 PERFORMANCE REQUIREMENTS

A. Design paving and subbase at streets and drives for light duty commercial vehicle traffic.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with State of Arkansas Highways standard.

B. Mixing Plant: Conform to State of Arkansas Highways standard.

C. Obtain materials from same source throughout.

1.07 REGULATORY REQUIREMENTS

A. Conform to Arkansas Highway and Transportation Department code for paving work on State Owned property.

1.08 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: ASTM D 946 and AASHTO M 226.

B. Aggregate for Binder Course-Gravel: or angular crushed, washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C 136, within the following limits:
      a. 1-1/2 inch sieve: 100 percent passing.
      b. 1 inch sieve: 90 to 100 percent passing.
      c. 3/4 inch sieve: 90 percent maximum passing.
      d. 8 sieve: 19 to 45 percent passing.
      e. No. 200: 1 to 7 percent passing.

C. Aggregate for Surface Course: Angular crushed washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C 136, within the following limits:

a. 1/2 inch sieve: 100 percent passing
b. No. 4 sieve: 60 to 80 percent passing.
c. No. 10 sieve: 40 to 60 percent passing.
d. No. 20 sieve: 22 to 47 percent passing.
e. No. 40 sieve: 15 to 40 percent passing.
f. No. 80 sieve: 8 to 24 percent passing

D. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

E. Primer: In accordance with State of Arkansas Highways standards.

F. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Surface Course: Section 407, Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 1993 (Type II Marshall Mix).
1. Fines to Asphalt Ratio: 0.60 to 1.4.
2. Asphalt Content: 4.5 to 7.5 percent
3. No. of Blows: 50
4. Minimum Marshall Stability: 1,000 lbs.
5. Marshall Flow (1/100"): 7 to 16
6. Percent Air Voids: 2.0 to 5.0
7. Minimum Percent VMA: 15
8. Minimum Water Sensitivity Ratio: 70 percent

B. Super-Pave Mix will not be allowed on this project. Material will be tested by the owner and if Super-Pave is found it will be removed at the Contractor's expense.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with Arkansas Highway and Transportation Department Standard Specifications, 1993.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads (proof roll with a fully loaded tri-axle dump truck).

B. Verify gradients and elevations of base are correct.

3.02 BASE COURSE

A. Section 32 1123 - Aggregate Base Courses.

3.03 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or subbase at uniform rate of 0.3 to 0.10 gal/sq yd.

C. Apply primer to contact surfaces of curbs, gutters, and other concrete or asphalt joints.

3.04 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 0.03 to 0.10 gal/sq yd.

C. Apply tack coat to contact surfaces of curbs, gutters and concrete drainage structures.

D. Coat surfaces of manhole frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with State of Arkansas Highways standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place to 3.5 inch compacted thickness at heavy duty paving.
   1. Contractor has option of 2 layers 1-3/4 inch each.

D. Install gutter drainage grilles and frames, manhole frames, and drainage items in correct position and elevation.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Variation from True Elevation: Within 1/2 inch.

3.07 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AASHTO T-164.

C. Provide Lab test results from hot mix samples pulled and tested at the production plant according to AHTD standard specifications.

3.08 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 7 days or until surface temperature is less than 140 degrees F.

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.

E. Section 32 1726 – Tactile Warning Surfaces

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 1713
PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2012.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2011a.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.

D. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

E. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete; 2009.

1.03 SUBMITTALS

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

B. Product Data: Provide unit configuration, dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking Bumpers: Precast concrete, conforming to the following:
   1. Nominal Size: 6 inches high, 8 inches wide, 6 feet long.
   2. Profile: As detailed on the drawings.
   3. Cement: ASTM C150, Portland Type I - Normal; gray color.
   4. Concrete Materials: ASTM C 33 aggregate, water, and sand.
   5. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished finish, strength and size commensurate with precast unit design.
   6. Air Entrainment Admixture: ASTM C260.
   7. Concrete Mix: Minimum 4000 psi, 28 day strength, air entrained to 4 percent.
   8. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
   9. Embed reinforcing steel, and drill or sleeve for two dowels.
   10. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   11. Minor patching in plant is acceptable, providing appearance of units is not impaired.

B. Dowels: Steel, unfinished; 1/2 inch diameter, 24 inch long, pointed tip.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels per unit.

3.02 SCHEDULE

A. Provide parking bumpers as shown in the drawings.

END OF SECTION

SECTION 32 1723.13
PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, arrows, and handicapped symbols.

1.02 RELATED REQUIREMENTS

A. Section 32 1216 - Asphalt Paving.

B. Section 32 1313 - Concrete Paving.

1.03 REFERENCE STANDARDS

A. S TT-P-115a Rapid Drying Paint

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. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 PROJECT CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; yellow.
   1. Parking Lots: Yellow; chrome yellow type, rapid drying meeting Federal Specification TT-P-115a.
   2. Handicapped Symbols: Blue; standard ADA requirement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.02 PREPARATION

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.

1. Apply paint in one coat only.
2. Wet Film Thickness: 0.015 inch, minimum.
3. Length Tolerance: Plus or minus 1/2" (.
4. Width Tolerance: Plus or minus 1/8 inch.

E. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
   1. Mark the International Handicapped Symbol at indicated parking spaces.
   2. Hand application by pneumatic spray is acceptable.

F. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

C. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

D. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

E. Replace removed markings at no additional cost to the Owner.

END OF SECTION

SECTION 32 1726
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Detectable warning surface.

1.02 REFERENCES

A. ATBCB ADAAG – Americans with Disabilities Act Accessibility Guidelines; US Architectural and Transportation Barriers Compliance Board; 2004

1.03 RELATED SECTIONS

A. Section 32 1313 - Concrete Paving

1.04 SUBMITTALS

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

B. Product data: Provide manufacturer's data sheets describing material, profile, color, and compliance with ADA.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Advantage Tactile Systems; www.advantagetactile.com

2.01 DETECTABLE WARNING SURFACE

A. Detectable warnings shall consist of raised truncated domes with a diameter of nominal 23 mm, a height of nominal 5 mm, and a center to center spacing of nominal 60 mm and shall contrast visually with adjoining surfaces, either light on dark, or dark on light. The material used to provide contrast shall be an integral part of the walking surface.

B. Design intent is to match color and finish of existing detectable warning surface materials on site.

PART 3 EXECUTION

3.01 INSTALLATION

A. Extend full width and depth of curb ramps as shown on drawings.

B. Install in strict accordance with manufacturer's instruction.

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 32 9223

SODDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Fertilizing.

D. Sod installation.

E. Maintenance.

1.02 RELATED SECTIONS

A. Section 31 2200 - Grading: Topsoil material.

B. Section 31 2200 - Grading: Preparation of subsoil and placement of topsoil in preparation for the work of this section.

C. Section 31 2323 - Fill: Topsoil material.

D. Section 32 0190 - Operation and Maintenance of Planting: Post-occupancy maintenance.

1.03 REFERENCES

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; Turfgrass Producers International; 1995.

1.04 DEFINITIONS

A. Weeds: Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 SUBMITTALS

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

B. Certification: Submit certification of grass species and location of sod source.

C. Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.06 QUALITY ASSURANCE

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Arkansas.

B. Installer Qualifications: Company approved by the sod producer.

1.07 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of fertilizer and herbicide mixture.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver sod on pallets. Protect exposed roots from dehydration.

B. Do not deliver more sod than can be laid within 24 hours.

1.09 MAINTENANCE SERVICE

A. Furnish service and maintenance of sodded areas for three months from Date of Substantial Completion.

B. Maintain sodded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sod: TPI, Certified Turfgrass Sod quality; cultivated grass sod; type indicated in plant schedule on Drawings; with strong fibrous root system, free of stones, burned or bare spots; containing no more than 5 weeds per 1000 sq ft. Minimum age of 18 months, with root development that will support its own weight without tearing, when suspended vertically by holding the upper two corners.
   1. Tifway 419 Bermuda Grass (Cynodon dactylon x Cynodon transvaalensis 'Tifway 419').
   2. Cut sod in area not exceeding 1 sq yd.
   3. Machine cut sod and load on pallets in accordance with TPI Guidelines.

B. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay, or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0. Six inches minimum of topsoil is to be provided in sod areas.

C. Topsoil: Excavated from site and free of weeds.

D. Fertilizer: Recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated by analysis.

E. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

2.02 ACCESSORIES

A. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slope.

2.03 HARVESTING SOD

A. Machine cut sod and load on pallets in accordance with TPI Guidelines.

B. Cut sod in area not exceeding 1 sq yd, with minimum 1/2 inch and maximum 1 inch topsoil base.

2.04 TESTS

A. Provide analysis of topsoil fill.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Submit minimum 10 oz sample of topsoil proposed. Forward sample to approved testing laboratory in sealed containers to prevent contamination.

D. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 31 2200.

B. Place topsoil in accordance with Section 31 2200.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to installation of sod.

C. Apply fertilizer no more than 48 hours before laying sod.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 LAYING SOD

A. Moisten prepared surface immediately prior to laying sod.

B. Lay sod immediately after delivery to site to prevent deterioration.

C. Lay sod tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces. Stagger sod strips to offset joints in adjacent courses.

D. Lay smooth. Align with adjoining grass areas.

E. Place top elevation of sod 1/2 inch below adjoining edging.

F. On slopes 6 inches per foot and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at maximum 2 feet on center. Drive pegs flush with soil portion of sod.

G. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

H. After sod and soil have dried, roll sodded areas to ensure good bond between sod and soil and to remove minor depressions and irregularities. Roll sodded areas in two directions perpendicular to each other. Heavy rolling to correct irregularities in grade will not be permitted.

3.05 MAINTENANCE

A. Mow grass at regular intervals to maintain at a maximum height of 2 inches. Do not cut more than 1/3 of grass blade at any one mowing.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove irregularities.

F. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.

G. Immediately replace sod to areas which show deterioration or bare spots.

H. Protect sodded areas with warning signs during maintenance period.

END OF SECTION

DIVISION 33

UTILITIES

SECTION 33 0513
MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete drainage junction boxes and accessories

1.02 RELATED SECTIONS

A. Section 33 4111, Storm Drainage Piping

1.03 REFERENCES

A. ASTM C 478 - Standard Specification for Precast Reinforced Concrete Manhole Sections; 2007.

B. ASTM C 923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2007.

1.04 SUBMITTALS

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

B. Manufacturer's Data:
   1. Precast concrete units
   2. Anchorage and accessories.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).

PART 2 PRODUCTS

2.01 MATERIALS

A. Precast Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with resilient connectors complying with ASTM C 923 (ASTM C 923M).

B. Concrete: As specified in Section 03 3000.

C. Concrete Reinforcement: As specified in Section 03 3000.

2.02 COMPONENTS

A. Lid and Frame: ASTM A 48/A 48M, Class 30B Cast iron construction, machined flat bearing surface, removable lid, closed lid design; ASTM A 48, Class 30;.

2.03 CONFIGURATION

A. Shaft Construction: Concentric with concentric cone top section; lipped male/female dry joints; sleeved to receive pipe sections.

B. Shape: Rectangular as detailed on the drawings

C. Clear Inside Dimensions: As shown on drawings.

D. Design Depth: As indicated.

E. Clear Opening: As indicated

F. Pipe Entry: Provide openings as indicated.

G. Steps: As required by code.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for structures is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 STRUCTURES

A. Place concrete base pad, trowel top surface level.

B. Place sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place structures plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. Cut and fit for pipe.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Set cover frames and covers level without tipping, to correct elevations.

G. Coordinate with other sections of work to provide correct size, shape, and location.

END OF SECTION

SECTION 33 4111
STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic pipe, joints, and accessories.

B. Bedding and slope protection at pipe end.

1.02 RELATED REQUIREMENTS

A. Section 01 3323 - Submittals, for submittal requirements.

B. Section 31 2316 - Excavation: Excavating of trenches.

C. Section 31 2323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 2007.

B. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2007.

C. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2011.

D. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2011.

E. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2010.

F. ASTM C443M - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric); 2010.

G. ASTM D 1785 - Standard Specification for Poly Vinyl Chloride)(PVC) Plastic Pipe, Schedule 40, 80, and 120.

1.04 SUBMITTALS

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

B. Product Data: Provide data on pipe, fittings and accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

D. Accurately record actual locations of pipe runs, connections, and invert elevations.

E. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for materials and installation of the work of this section.

PART 2 PRODUCTS

2.01 CONCRETE CULVERT PIPE

A. Manufacturers:
   1. Scurlock Industries, Jonesboro, Arkansas
   2. Substitutions: See Section 01 6000 - Product Requirements.

B. Concrete Pipe: Reinforced, ASTM C 76 (ASTM C 76M), Class III with Wall Type A; mesh reinforcement; Type D end joints.
   1. Shape: Circular

C. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

2.02 PLASTIC PIPE MATERIALS

A. Plastic Pipe: ASTM D 1785, Schedule 40, Poly (Vinyl Chloride) (PVC) material; bell and spigot style solvent sealed joint end.

2.03 BEDDING AND COVER MATERIALS

A. Bedding: As specified in Section 31 2323.

2.04 ACCESSORIES

A. Provide flare-end sections at ends of pipe.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.05 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified in Section 31 2323

B. Pipe Cover Material: As specified in Section 31 2316

PART 3 EXECUTION

3.01 EXCAVATING

A. Excavate culvert trench to 12 inches below pipe invert. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. See Section 31 2316 for additional requirements

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

B. Install pipe and accessories in accordance with manufacturer's instructions

C. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.

D. Shore pipe to required position; retain in place until after compaction of adjacent fills. Ensure pipe remains in correct position and to required slope.

3.03 ERECTION TOLERANCES

A. Lay pipe to alignment and slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

B. Maximum Variation From Intended Elevation of Culvert Invert: 1/2 inch.

C. Maximum Offset of Pipe From True Alignment: 1 inch.

D. Maximum Variation in Profile of Structure From Intended Position: 1 percent.

3.04 PROTECTION

A. Protect pipe and bedding from damage or displacement until backfilling operation is in progress.

END OF SECTION

The engineer of Record for Divisions 21, 22, 23 of the specifications for the Black River Tech Barracks is:

David Alexander Trulove, PE

SECTION 210000

FIRE PROTECTION SPRINKLER SYSTEM

PART 1 GENERAL

1.01. SUMMARY

A. Provide a complete and working wet pipe sprinkler system as indicated herein and/or shown on drawings. Provide labor, materials, and perform all operations required and reasonably implied in the provision of the wet pipe sprinkler system. Contractor shall arrange all permits and inspections and pay all associated fees.

B. The Contractor shall design a fire protection sprinkler system based on NFPA requirements for occupancy.

C. Contractor shall be responsible for provision of all other phases in the contract documents such as mechanical, structural, electrical and architectural systems and shall design to facilitate all features of the building while complying with NFPA.

D. Any conflict between the governing authority and the plans and specifications shall be called to the attention of the Engineer.

E. Coordinate closely with fire alarm and electrical power systems for special use areas such as elevators and electrical equipment rooms.

1.02. PERFORMANCE REQUIREMENTS

A. Standard Piping System Component Working Pressure: Listed for at least 175 psig.

B. Fire-suppression sprinkler system design shall be approved by authorities having jurisdiction.

1.03. SUBMITTALS

A. Product Data: For the following:

1. Piping materials, including dielectric fittings and flexible connections and sprinkler specialty fittings.

2. Pipe hangers and supports.

3. Valves, including listed fire-protection valves, unlisted general-duty valves, and specialty valves and trim.

4. Sprinklers, escutcheons, and guards. Include sprinkler flow characteristics, mounting, finish, and other pertinent data.

5. Monitors.

6. Alarm devices, including electrical data.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13,

that have been approved by authorities having jurisdiction, including hydraulic calculations, if applicable.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

E. Welding certificates.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.04. QUALITY ASSURANCE

A. Installer Qualifications and Responsibilities:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

2. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

C. NFPA Standards: Fire-suppression-system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."

2. NFPA 14, "Standpipe and Hose Systems."

1.05. COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.06. EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounting, steel cabinet with hinged cover, with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13 and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler on Project.

PART 2 PRODUCTS

2.01. STEEL PIPE AND FITTINGS

A. Threaded-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, with factory- or field-formed threaded ends.

1. Malleable-Iron Threaded Fittings: ASME B16.3.

2. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.

3. Steel Threaded Couplings: ASTM A 865.

B. Plain-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.

2. Steel Flanges and Flanged Fittings: ASME B16.5.

C. Threaded-End, Schedule 30 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A 795 and ASME B36.10M, Schedule 30 wrought-steel pipe; with factory- or field-threaded ends.

1. Malleable-Iron Threaded Fittings: ASME B16.3.

2. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe. Include ends matching joining method.

3. Steel Threaded Couplings: ASTM A 865.

D. Plain-End, Schedule 30 Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and equal to or greater than Schedule 30; or ASTM A 795 and ASME B36.10M, Schedule 30 wrought-steel pipe.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.

2. Steel Flanges and Flanged Fittings: ASME B16.5.

E. Threaded-End, Threadable, Thinwall Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and greater than Schedule 10, and with factory- or field-formed threaded ends.

1. Malleable-Iron Threaded Fittings: ASME B16.3.

2. Steel Threaded Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106, Schedule 40, seamless steel pipe.

3. Steel Threaded Couplings: ASTM A 865.

F. Plain-End, Threadable, Thinwall Steel Pipe: ASTM A 135 or ASTM A 795, with wall thickness less than Schedule 40 and greater than Schedule 10.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or

ASME B16.11.

2. Steel Flanges and Flanged Fittings: ASME B16.5.

G. Plain-End, Schedule 10 Steel Pipe: ASTM A 135 or ASTM A 795, Schedule 10 in NPS 5 and smaller.

1. Steel Welding Fittings: ASTM A 234/A 234M, and ASME B16.9 or ASME B16.11.

H. Grooved-End, Standard-Weight Steel Pipe: ASTM A 53/A 53M, ASTM A 135, or ASTM A 795, hot-dip galvanized where indicated and with factory- or field-formed, square-cut- or roll-grooved ends.

1. Grooved-End Fittings: UL-listed, ASTM A 536, ductile-iron casting with OD matching steel-pipe OD.

2. Grooved-End-Pipe Couplings: UL 213 and AWWA C606, rigid pattern, unless otherwise indicated; gasketed fitting matching steel-pipe OD. Include ductile-iron housing with keys matching steel-pipe and fitting grooves, prelubricated rubber gasket listed for use with housing, and steel bolts and nuts.

2.02. DIELECTRIC FITTINGS

A. Assembly shall be copper alloy, ferrous, and insulating materials with ends matching piping system.

B. Dielectric Unions: Factory-fabricated assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar materials and ends with inside threads according to ASME B1.20.1.

C. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 175-psig minimum working-pressure rating as required for piping system.

D. Dielectric Flange Insulation Kits: Components for field assembly shall include CR or phenolic gasket, PE or phenolic bolt sleeves, phenolic washers, and steel backing washers.

E. Dielectric Couplings: Galvanized steel with inert and noncorrosive thermoplastic lining and threaded ends and 300-psig working-pressure rating at 225 deg F.

F. Dielectric Nipples: Electroplated steel with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved ends and 300-psig working-pressure rating at 225 deg F.

2.03. FLEXIBLE CONNECTORS

A. Flexible connectors shall have materials suitable for system fluid. Include 175-psig working-pressure rating and ends according to the following:

1. NPS 2 and Smaller: Threaded.

2. NPS 2-1/2 and Larger: Flanged.

B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with

bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.

C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

2.04. SPRINKLER SPECIALTY FITTINGS

A. Sprinkler specialty fittings shall be UL listed or FMG approved, with 175-psig minimum working-pressure rating, and made of materials compatible with piping.

B. Sprinkler Drain and Alarm Test Fittings: Cast- or ductile-iron body; with threaded or locking-lug inlet and outlet, test valve, and orifice and sight glass.

C. Sprinkler Branch-Line Test Fittings: Brass body with threaded inlet, capped drain outlet, and threaded outlet for sprinkler.

D. Drop-Nipple Fittings: UL 1474, adjustable with threaded inlet and outlet, and seals.

2.05. LISTED FIRE-PROTECTION VALVES

A. Valves shall be UL listed or FMG approved, with 175-psig minimum pressure rating.

B. Gate Valves with Wall Indicator Posts:

1. Gate Valves: UL 262, cast-iron body, bronze mounted, with solid disc, nonrising stem, operating nut, and flanged ends.

2. Indicator Posts: UL 789, horizontal-wall type, cast-iron body, with hand wheel, extension rod, locking device, and cast-iron barrel.

C. Ball Valves: Comply with UL 1091, except with ball instead of disc.

1. NPS 1-1/2 and Smaller: Bronze body with threaded ends.

2. NPS 2 and NPS 2-1/2: Bronze body with threaded ends

D. Butterfly Valves: UL 1091.

1. NPS 2 and Smaller: Bronze body with threaded ends.

2. NPS 2-1/2 and Larger: Bronze, cast-iron, or ductile-iron body; wafer type or with flanged ends.

E. Check Valves NPS 2 and Larger: UL 312, swing type, cast-iron body with flanged ends.

F. Gate Valves: UL 262, OS&Y type.

1. NPS 2 and Smaller: Bronze body with threaded ends.

2. NPS 2-1/2 and Larger: Cast-iron body with flanged ends.

G. Indicating Valves: UL 1091, with integral indicating device and ends matching connecting piping.

1. Indicator: Electrical, 115-V ac, prewired, single-circuit, supervisory switch.

2. NPS 2 and Smaller: Ball or butterfly valve with bronze body and threaded ends.

3. NPS 2-1/2 and Larger: Butterfly valve with cast- or ductile-iron body; wafer type or with flanged ends.

2.06. UNLISTED GENERAL-DUTY VALVES

A. Ball Valves NPS 2 and Smaller: MSS SP-110, 2-piece copper-alloy body with chrome-plated brass ball, 600-psig minimum CWP rating, blowout-proof stem, and threaded ends.

B. Check Valves NPS 2 and Smaller: MSS SP-80, Type 4, Class 125 minimum, swing type with bronze body, nonmetallic disc, and threaded ends.

C. Gate Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, solid wedge, and threaded ends.

D. Globe Valves NPS 2 and Smaller: MSS SP-80, Type 2, Class 125 minimum, with bronze body, nonmetallic disc, and threaded ends.

2.07. SPECIALTY VALVES

A. Pressure-Regulating Valves: UL 1468, brass or bronze, NPS 1-1/2 and NPS 2-1/2, 400-psig minimum rating. Include female NPS inlet and outt, adjustable setting feature, and straight or 90-degree-angle pattern design as indicated. Finish: Rough metal.

B. Automatic Drain Valves: UL 1726, NPS 3/4, ball-check device with threaded ends.

2.08. SPRINKLERS

A. Sprinklers shall be UL listed or FMG approved, with 175-psig minimum pressure rating.

B. Automatic Sprinklers: With heat-responsive element complying with the following:

1. UL 1626, for residential applications.

2. UL 1767, for early-suppression, fast-response applications.

C. Sprinkler Types and Categories: Nominal 1/2-inch orifice for "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

1. Open Sprinklers: UL 199, without heat-responsive element.

a. Orifice: 1/2 inch, with discharge coefficient K between 5.3 and 5.8.

b. Orifice: 17/32 inch, with discharge coefficient K between 7.4 and 8.2.

D. Sprinkler Finishes: Chrome plated, bronze, and painted.

E. Special Coatings: Wax, lead, and corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting

applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Plastic, white finish, one piece, flat.

2. Sidewall Mounting: Plastic, white finish, one piece, flat.

G. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

PART 3 EXECUTION

3.01. PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in Part 1 "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.02. EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thicknesses, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.03. PIPING APPLICATIONS, GENERAL

A. Shop weld pipe joints where welded piping is indicated.

B. Do not use welded joints for galvanized-steel pipe.

C. Flanges, flanged fittings, unions, nipples, and transition and special fittings with finish and pressure ratings same as or higher than system's pressure rating may be used in aboveground applications, unless otherwise indicated.

3.04. JOINT CONSTRUCTION

A. Threaded Joints: Comply with NFPA 13 for pipe thickness and threads. Do not thread pipe smaller than NPS 8 with wall thickness less than Schedule 40 unless approved by authorities having jurisdiction and threads are checked by a ring gage and comply with ASME B1.20.1.

B. Dissimilar-Metal Piping Joints: Construct joints using dielectric fittings compatible with both piping materials.

1. NPS 2 and Smaller: Use dielectric unions, couplings, or nipples.

2. NPS 2-1/2 to NPS 4: Use dielectric flanges.

3. NPS 5 and Larger: Use dielectric flange insulation kits.

3.05. INTERIOR PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

C. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 and larger connections.

D. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, sized and located according to NFPA 13.

E. Install sprinkler piping with drains for complete system drainage.

F. Install sprinkler zone control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

G. Hangers and Supports: Comply with NFPA 13 for hanger materials.

1. Install sprinkler system piping according to NFPA 13.

H. Fill wet-pipe sprinkler system piping with water.

I. Install alarm devices in piping systems.

3.06. VALVE INSTALLATION

A. Install listed fire-protection valves, unlisted general-duty valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections. Install permanent identification signs indicating portion of system controlled by each valve.

3.07. SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels and tiles.

B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing. Use dry-type sprinklers with water supply from heated space.

3.08. MONITOR INSTALLATION

A. Install monitor bases securely attached to building substrate.

3.09. CONNECTIONS

A. Install piping adjacent to equipment to allow service and maintenance.

B. Electrical Connections: Power wiring is specified in Division 16 (22).

C. Connect alarm devices to fire alarm.

D. Ground equipment according to Division 22 Section "Grounding and Bonding."

E. Connect wiring according to Division 22 Section "Conductors and Cables."

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.10. LABELING AND IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13 and in Specification Section "Mechanical Identification."

3.11. FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3. Energize circuits to electrical equipment and devices.

4. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.

5. Coordinate with fire alarm tests. Operate as required.

6. Verify that equipment hose threads are same as local fire department equipment.

B. Report test results promptly and in writing to Architect and authorities having jurisdiction.

3.12. CLEANING AND PROTECTION

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Protect sprinklers from damage until Substantial Completion.

3.13. DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain specialty valves.

END OF SECTION

SECTION 22 00 00 -
PLUMBING BASICS

PART 1 GENERAL

1.01. SCOPE:

A. Install all fixtures as shown on the plans. Field verify exact locations.

B. Provide all equipment and specialties shown on the plans or specified herein.

C. Provide all necessary support, trim and accessories required.

D. All fixtures indicated to be ADA compliant and shall be installed in full compliance with ADA guidelines.

1.02. Fixtures shall be equal to those scheduled on the Drawings.

1.03. All items furnished under this section shall be submitted for approval prior to ordering.

1.04. Fixtures shall meet all applicable code requirements and all authorities having jurisdiction.

PART 2 PRODUCTS

2.01. GENERAL:

A. Fixtures shall be non-absorbent throughout and free from waves, kiln marks or discoloration.

B. All surfaces coming in contact with walls, floors or other flat surfaces shall be flat.

C. All enameled iron ware shall be acid-resisting.

2.02. TRIM:

A. All exposed finished metal parts shall be chromium-plated; except, rough-bodied parts shall be nickel-plated.

B. All supplies shall be IPS brass; except, where otherwise specified.

C. All fixtures will be provided with supply stop.

D. Traps for lavatories and sinks shall be chrome-plated cast brass P-traps with clean-out.

E. Provide cast brass, chrome-plated, set screw type, escutcheons on supply and waste piping.

F. All trim for ADA fixtures shall be ADA-compliant.

2.03. CLEAN OUTS:

A. Caulking plugs: Cast iron cleanouts for caulking into soil pipe hub with straight threaded, plated raised hex head plug having tapered shoulder that seats against seal.

B. Wall cleanouts for dry wall or block construction shall be cast iron caulking ferrule for soil pipe hub, plated cast iron raised head plug with seal, tapped for machine screw, and stainless steel round access cover plate secured to plug by counter-sunk brass screw.

C. Wall cleanouts for plaster for tile wall construction shall be cast iron caulking ferrule for soil pipe hub, plated cast iron raised head plug with seal, tapped for machine screw, and cast Nickel alloy round flush access cover with polished top, anchor lugs, and cover plate secured to plug by counter-sunk brass screw.

D. Floor cleanouts shall be adjustable cast iron floor cleanout, coated cast iron internal cleanout plug with seal, polished nickel alloy rim and round scoriated cover plate, secured to plug by counter-sunk screw. Provide recessed top where cleanout occurs in tile floor. Provide cleanout marker when cleanout occurs in carpet.

E. Cleanouts to grade shall be cast iron cleanout, plated cast iron counter-sunk plug with seal, adjustable head and heavy-duty loose set round scoriated tractor cover.

2.04. WATER HEATERS:

A. Provide tank water heaters with ASTM rated T&P valve. T&P valve shall discharge per authority having jurisdiction, full size to outside the building or to an indirect waste receptor by means of an air gap.

B. Provide tank water heater with drain pan per authority having jurisdiction.

C. Provide tank water heater with Thermal Expansion tank per authority having jurisdiction.

PART 3 EXECUTION

3.01. All fixtures subject to damage prior to completion of building shall be protected in an approved manner. Job must be turned over to Owner with all fixtures clean and free from damage.

3.02. All wall-hung water closets and urinals shall be supported on chair carriers.

3.03. Unless specified to be furnished with chair carrier, wall-hung lavatories, sinks, and other fixtures. shall be secured to wall with back-up plate and threaded rods. Contractor shall provide all backing, reinforcing, hangers, bolts, anchors and brackets required.

3.04. Fixtures mounted and on uneven surfaces shall be bedded in an approved manner as per fixture manufacturer, owner, and engineer.

3.05. All hot and cold water supplies to plumbing fixtures or to shower heads shall have a drop-ear fitting secured to prevent movement.

3.06. AMERICANS WITH DISABILITIES ACT

A. All plumbing facilities shall be installed in compliance with the requirements of the Americans with Disabilities Act. Requirements include the following:

1. Water closet flush controls shall be mounted on the wide side of the toilet area.

2. Tub controls shall be mounted on the end wall on the entry side of the tub centerline.

3. Shower controls on stalls up to 36” wide shall be mounted on the side wall opposite the seat on the entry side of the shower centerline, and on stalls up to 60” wide shall be mounted on the back wall on the right side of the centerline.

4. Hot water piping and traps on fixtures supplied with hot water shall be insulated.

5. All controls and operating mechanisms shall be operable with one hand and without tight grasping, pinching, or twisting of the wrist.

B. Fixture and controls mounting heights, clear knee space, access clearances, etc. shall comply with ADA required dimensions, and as on details or schedules when shown.

3.07. Do not route piping through electrical or electronic enclosures, or above electrical gear located in other areas unless unavoidable. Install drip pan under piping which must be run through electrical spaces. Installation to be per National Electrical Code and as approved by local authority.

END OF SECTION

SECTION 22 0015
FIRESTOPPING AND SMOKE STOPPING

PART 1 - GENERAL

1.01. SUMMARY

A. Section includes:

1. Through-penetration firestopping in fire rated construction.

B. Scope:

1. The scope of the work shall include the mechanical systems, HVAC piping and ductwork, plumbing piping, fire protection piping, and other systems installed by the contractor.

1.02. 1.02 REFERENCES

A. Underwriters Laboratories

1. U.L. Fire Resistant Directory

a. Through-penetration firestop devices (XHCR)

b. Fire resistance ratings (BXUV)

c. Through-penetration firestop systems (XHEZ)

d. Fill, void, or cavity material (XHHW)

B. American Society for Testing and Materials Standards:

1. ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.03. 1.03 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, time rated ceiling/floor assemblies, and structural floors.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

F. Sleeve: Metal fabrication or pipe section extending through thickness off barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.04. SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.05. SUBMITTALS

A. Submit in accordance with general conditions unless otherwise indicated.

B. Product data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication

2. Manufacturer's installation instructions.

C. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.

2. Manufacturer or manufacturers’ representative shall provide qualified engineering judgements and drawings relating to non-standard applications as needed.

D. Quality control submittals:

1. Statement of qualifications.

E. Applicators' qualifications statement:

1. List past projects indicating required experience.

1.06. QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07. REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of combustibility.

1.08. ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

D. Furnish forced air ventilation during installation if required by manufacturer.

E. Keep flammable materials away from sparks or flame.

F. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

G. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.09. SEQUENCING

A. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

1.10. QUALITY ASSURANCE

A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State or local authority where applicable.

2. At least 2 years experience with systems.

3. Successfully completed at least 5 comparable scale projects using this system.

B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.11. DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instruction.

1.12. PROJECT CONDITIONS

A. Existing conditions:

1. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

1.13. GUARANTEE

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

PART 2 PRODUCTS

2.01. THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the U.L. Fire Resistance Director under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.

2. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance directory for the U.L. System involved and as further defined in Part 3.06 of this section.

3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

4. Products shall be 3M firestopping products and systems or equal.

2.02. SMOKE-STOPPING AT SMOKE PARTITIONS

A. Through-Penetration Smoke-Stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in this section, is

acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

B. Construction-Gap Smoke-Stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.03. MATERIALS

A. Firestopping Material: Single or multiple component silicone elastomeric rubber type foam compound mixed with incombustible non-asbestos ceramic fibers.

B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

2.04. 2.04 ACCESSORIES

A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

B. Forming materials: As classified under Category XHKU in the U.L. Fire Resistance Directory.

PART 3 EXECUTION

3.01. EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.02. SURFACE PREPARATION

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.03. INSTALLATION

A. Apply primer and materials in accordance with manufacturer’s instructions.

B. Install penetration seal materials in accordance with printed instruction of the U.L. Fire Resistance Directory and in accordance with manufacturer’s instruction.

C. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

D. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same

loading as floor.

E. Apply firestopping material in sufficient thickness to achieve rating and to a uniform density and texture.

F. Protect materials from damage on surfaces subject to traffic.

G. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

H. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges - installed in accordance with fire damper manufacturer's recommendations.

I. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See U.L. Fire Resistance Directory.

J. Install smoke stopping as specified for firestopping.

K. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical 12 inch wide fiber dams for full thickness and height of air cavity at maximum 15 foot intervals.

L. Dam material to remain.

3.04. FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.05. ADJUSTING AND CLEANING

A. Clean adjacent surfaces of firestopping materials.

B. Clean up spills of liquid components.

C. Neatly cut and trim materials as required.

D. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.06. PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.07. SYSTEMS AND APPLICATION

A. The installation shall be as required by manufacturer for type of construction, Type of

U.L. systems, type of penetration, and type of fire stopping system.

END OF SECTION

SECTION 220030

ELECTRICAL REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This section specifies the basic requirements for electrical components which are to be provided for operation of mechanical equipment. These components include, but are not limited to, motors, starters, and disconnect switches when indicated, furnished as an integral part of packaged mechanical equipment, or furnished separately for mechanical equipment.

B. Furnish all motor controllers and contactors, not furnished as part of a motor control center, for proper operation of all motors.

C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections and scheduled on the drawings.

1.02 REFERENCES:

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. National Electric Code (NFPA 70).

1.03 SUBMITTALS:

A. Separate submittal is not required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.04 QUALITY ASSURANCE:

A. Electrical components and materials shall be UL labeled.

B. The electrical work shall comply with the National Electric Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Equipment shall be by same manufacturer, except those items furnished by an equipment manufacturer as an integral part of his equipment. Where possible the equipment shall be by the same manufacturer specified by electrical.

2.02 MOTORS: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are included in the individual equipment

specifications.

A. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

B. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

C. 2-speed motors shall have 2 separate windings on poly-phase motors.

D. Temperature Rating: Rated for 40 degrees C (104 degree F). environment with maximum 90 degree C (194 degree F) rise for continuous duty at full load (Class B insulation).

E. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly spaced starts per hour for manually controlled motors.

F. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

G. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

1. Frames: NEMA Standard No. 48 or 56; use driven equipment manufacturer's standards to suit specific application.

2. Bearings:

a. Ball or roller bearings with inner and outer shaft seals.

b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.

c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.

3. Enclosure Type:

a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.

b. Guarded drip-proof motors where exposed to contact by employees or building occupants.

c. Weather protected Type I for outdoor use, Type II where not housed.

4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

5. Noise Rating: "Quiet".

6. Efficiency:

a. Motor shall comply with the efficiency requirements of the Energy Independence and Security Act of 2007.

b. Motors smaller than 1 HP shall have minimum full load efficiencies levels

per NEMA Standards.

c. Motors 1 HP and larger shall be premium efficiency.

7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

2.03 STARTERS, ELECTRICAL DEVICES, AND WIRING:

A. Motor Starter Characteristics:

1. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R or NEMA 12 with conduit hubs installed by contractor, or units in hazardous locations which shall have NEC proper class and division.

2. Type and size of starter shall conform to adopted standards and recommended practices of the National Electric Code and Underwriters' Laboratories.

B. Manual Switches: Manual switches shall have:

1. Pilot lights and extra positions for multi-speed motors.

2. Overload protection: Melting alloy type thermal overload relays.

3. Manual starters / switches are to be used on fractional horsepower motors only.

C. Magnetic Starters:

1. Momentary contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

2. Trip-free thermal overload relays, each phase.

3. Interlocks, witches and similar devices as required for coordination with control requirements of controls sections.

4. Built-in 120 volt control circuit transformer, with 2 primary and one secondary fuse, where service exceeds 240 volts. Fuses sized to carry holding coil circuit and other connected devices.

5. Externally operated manual reset.

6. Under-voltage release or protection (3-wire control).

7. Branch circuit protection shall meet type 2 coordination protection.

8. A hand-off-auto selector switch shall be provided in addition to start-stop buttons for all devices being controlled automatically.

9. Phase loss relay.

a. Provide protective relays with DPDT 600V rated contacts, locking potentiometer undervoltage adjustment, and LED indicating light at each starter for motors greater than 5 HP. Equal to Square D Class 8430, Type MPD, mounted in suitable enclosure.

D. Motor Connections:

1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

E. Heater Contactors:

1. Contactors for resistance heat shall be by same manufacturer as starters unless furnished with heaters. Contactors shall be of the magnetic type and mounted in NEMA Type 1 general purpose enclosure. Contactors shall carry a UL listing and shall be rated for 100,000 cycles.

F. Disconnect Switches:

1. Fusible Switches: Fused, each phase; heavy duty; horsepower rated; non-teasible, quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "open" position; arc quenchers; capacity and characteristics as indicated.

2. Non-fusible Switches: For equipment less than 1 horsepower, switches shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment 1 horsepower and larger, switches shall be the same as fusible type.

2.04 CAPACITORS:

A. Features:

1. Individual unit cells, all welded steel housing, each capacitor internally fused, non-flammable synthetic liquid impregnant, craft tissue insulation, and aluminum foil electrodes.

2. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower and larger that have an uncorrected power factor of less than 85 percent at rated load.

PART 3 - EXECUTION

3.01 GENERAL

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 hp and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Deliver starters and wiring devices which have not been factory-installed on equipment unit to electrical installer for installation.

C. Install starters and wiring devices at locations indicated, securely supported and anchored, and in accordance with manufacturer's installation instructions. Locate for proper operation access, including visibility, and for safety. Do not cover equipment data or informational tags when device is to be mounted on equipment.

D. Install control connections for motors to comply with NEC and applicable provisions of

Electrical. Install equipment grounding except where non-grounded isolation of motor is indicated.

E. Connect protective relays to line side lugs of the motor starter and wire control contacts into motor starter circuit.

F. Label starters with engraved plastic nameplate describing the equipment served, e.g., "A.C. Unit No. 1". Nameplates shall be U.V. stabilized for use indoor / outdoor. Attach nameplates with clear silicone sealant.

END OF SECTION

SECTION 22 0086

PIPING INSULATION

PART 1 - GENERAL

1.01. SUMMARY

A. Perform all Work required to provide and install piping insulation, jackets, and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Insulation of Underground Piping is specified elsewhere and not work of this Section.

1.02. REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.

3. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.

4. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

5. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

6. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

8. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

9. ASTM C547 - Mineral Fiber Pipe Insulation.

10. ASTM C552 - Cellular Glass Thermal Insulation.

11. ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

13. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

14. ASTM C450 - Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

15. ASTM C610 - Molded Expanded Perlite Block and Pipe Thermal Insulation.

16. ASTM C921 - Jackets for Thermal Insulation.

17. ASTM C1126 - Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

18. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

19. ASTM D1667 - Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed- Cell).

20. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

21. ASTM C795 - Insulation For Use Over Austenitic Steel.

22. ASTM E84 - Surface Burning Characteristics of Building Materials.

23. ASTM E96 - Water Vapor Transmission of Materials.

24. NFPA 255 - Surface Burning Characteristics of Building Materials.

25. UL 723 - Surface Burning Characteristics of Building Materials.

26. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.03. DEFINITIONS

A. Concealed: Areas that cannot be seen by the building occupants.

B. Interior Exposed: Areas that are exposed to view by the building occupants, including underneath countertops, inside cabinets and closets, and all equipment rooms.

C. Interior: Areas inside the building exterior envelope that are not exposed to the outdoors.

D. Exterior: Areas outside the building exterior envelope that are exposed to the outdoors, including building crawl spaces and loading dock areas.

E. Unconditioned Space: Interior space that is not temperature-controlled by cooling and/or heating system. Includes attics, chases, unconditioned living spaces and non-conditioned equipment rooms.

1.04. QUALITY ASSURANCE

A. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, and accessories utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50

smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement.

1. Certificates to this effect shall be submitted along with submittal data.

2. No material shall be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Company Qualifications: Company performing the Work of this Section shall have minimum three (3) years experience specializing in the trade.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, damaged or water-soaked Work will not be acceptable.

F. Stainless Steel: Insulation applied on stainless steel shall meet requirements of ASTM C795 and NRC 1.36. These requirements are for prevention of external stress Corrosion Cracking (ESCC) for austenitic stainless steel.

1.05. SUBMITTALS

A. Prepare a schedule of piping insulation showing systems insulated. For each system, show insulation type, thickness, temperature rating, and special conditions where applicable.

B. Submit product data for each piping system. Product data shall include but not be limited to the following:

1. Manufacturer's name

2. Insulation material and thickness

3. Jacket

4. Adhesives

5. Fastening methods

6. Fitting materials

7. Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings

8. Insulation installation details (manufacturer's installation instructions/details, Contractor's installation details, MICA plates where applicable)

9. Other appropriate data

C. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.

D. Operation and Maintenance Data: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.06. DELIVERY, STORAGE and HANDLING

A. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.

B. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

C. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01. GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02. MANUFACTURERS

A. Insulation:

1. Owens-Corning
2. Certainteed Corporation
3. Johns Manville Corporation
4. Knauf Corporation
5. Armstrong/Armacell (Armaflex)
6. RBX Industries/Rubatex
7. FOAMGLAS (Cellular Glass) by Pittsburgh Corning

B. Jackets:

1. Childers Products Company
2. PABCO
3. RPR Products, Inc.
4. John Mansfield Speedline
5. Foamglas

C. Coatings, Sealants, and Adhesives:

1. Foster

2. Childers

2.03. INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Piping Insulation Type P1: Glass-Fiber, Preformed Pipe Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A with factory applied ASJ-SSL vapor barrier jacket with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I. Provide one of the following:

1. Owens Corning; Evolution Fiberglas Pipe Insulation.

2. Johns Manville; Micro-Lok Pipe Insulation.

3. Knauf; Earthwool 1000 degree Pipe Insulation.

F. Piping Insulation Type P2: Flexible Elastomeric Pipe Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Provide one of the following:

1. Armacell LLC; AP Armaflex

2. Aeroflex USA Inc; Aerocel

3. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Piping Insulation Type P3: Handicap Lavatory and Sink Piping Insulation Kit:

1. Handicap lavatory and sink drain piping, P-trap, cold and hot water assemblies and valves shall be insulated with fully molded insulation kit specifically designed for handicap lavatories and sinks. ADA conforming.

2. Material shall be 3/16" thick molded closed cell vinyl with nylon fasteners, white finish and be self-extinguishing per ASTM D635, with K value of 1.17 BTU/in./hr./sq. ft./deg. F.

H. Piping Insulation Type P4: Preformed Cellular Glass: Comply with ASTM C 585, ASTM C 450. Provide one of the following:

1. Pittsburgh Corning; Foamglas

2.04. FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe. Provide one of the following:

1. Foster Brand, Specialty Construction Brands, Inc; Mast-A-Fab.

2. Vimasco Corporation; Elastafab 894.

2.05. FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Piping Jacket Type J1: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; 40 mil thickness, roll stock ready for shop or field cutting and forming. Provide factory-fabricated fitting covers to match jacket. Provide one of the following

1. Johns Manville; Zeston.

2. Proto Corporation; LoSmoke

C. Piping Jacket Type J2: Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14. Provide factory-fabricated fitting covers or field fabricate covers only if factory-fabricated fitting covers are not available. Provide one of the following:

1. Provide Childers Brand Metal Jacketing Systems.

2. Provide shop fabricated smooth aluminum jacket 0.016".

2.06. TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.

2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.

2. Thickness: 6 mils.

3. Adhesion: 64 ounces force/inch in width.

4. Elongation: 500 percent.

5. Tensile Strength: 18 lbf/inch in width.

2.07. INSULATION INSERTS

A. Provide insert between support shield and piping on piping 1 1/2" diameter or larger. Inserts shall be factory fabricated of heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1. 1 1/2" to 2 1/2" pipe size 10" long

2. 3" to 6" pipe size 12" long

3. 8" to 10" pipe size 16" long

4. 12" and over 22" long

2.08. PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.

B. Covering Adhesive Mastic: Compatible with insulation.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12-inch centers.

D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

E. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

F. Adhesives: Compatible with insulation.

G. Banding:

1. Aluminum bands, 3/4" x 0.02 inches

2. Stainless Steel, 304, 3/4" by 0.02 inches

PART 3 - EXECUTION

3.01. PREPARATION

A. Thoroughly clean all surfaces to be insulated as required to remove all oil, grease, loose scale, rust, and foreign matter. Piping shall be completely dry at the time of application. Insulating piping where condensate is occurring is unacceptable. Wet insulation is unacceptable and shall be removed and replaced before acceptance by the Owner.

B. Coordinate insulation installation with trade installing heat trace. Comply with requirements for heat tracing that apply to insulation.

C. Verify that piping has been tested for leakage before applying insulation.

3.02. GENERAL INSTALLATION REQUIREMENTS

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards, and shall conform to codes and ordinances of authorities having jurisdiction.

B. Installation of insulation and jacket materials shall be in accordance with manufacturer's published instructions.

C. Handle and install materials in accordance with manufacturer's instructions in the absence of specific instructions herein.

D. On exposed piping, locate insulation cover seams with the ridge of the lap joint is directed down.

E. Provide dams in insulation at intervals not to exceed 20 feet on cold piping systems to prevent migration of condensation or fluid leaks. Indicate visually where the dams are located for maintenance personnel to identify and also provide dams at butt joints of insulation at fittings, flanges, valves, and hangers.

F. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

G. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

H. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

I. Install insulation with longitudinal seams at top and bottom of horizontal runs.

J. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

K. Keep insulation materials dry during application and finishing.

L. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

M. Install insulation with least number of joints practical.

N. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

O. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

P. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

Q. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

R. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

S. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere and seal patches similar to butt joints.

T. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3.03. PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Comply with requirements in Section 15050 for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 15050."

3.04. GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket where concealed unions, check valve or piping specialties are insulated. Provide descriptive label at device under the insulation. For example at each union stencil with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05. INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.06. INSTALLATION OF GLASS-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on below-ambient surfaces, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.07. FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.08. FINISHES

A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

B. Do not field paint aluminum jackets.

3.09. PIPING SYSTEMS INSULATION SCHEDULE

PIPING SYSTEMS INSULATION SCHEDULE					
SERVICE	INSULATION TYPE	LOCATION	JACKET TYPE	PIPE SIZE	INSULATION THICKNESS BY PIPE SIZE
COLD PIPING					
DOMESTIC COLD WATER	P1	INTERIOR CONCEALED	--	0.5" AND SMALLER	0.5"
				1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		EXTERIOR	J2	0.5" AND SMALLER	1.0"
				1.0" THROUGH 2.0"	1.5"
				2.5" AND LARGER	2.0"
		EQUIPMENT ROOMS	J1	0.5" AND SMALLER	0.5"
		BELOW 7.0" ABOVE FLOOR		1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
COOLING COIL CONDENSATE	P2	INTERIOR CONCEALED	--	3.0" AND SMALLER	0.5"
BRANCH LINES				4.0" AND	0.75"

				LARGER	
COOLING COIL CONDENSATE		INTERIOR EXPOSED	J1	3.0" AND SMALLER	0.5"
SEWER/STORM DRAIN LINES		UNCONDITIONED	--	3.0" AND SMALLER	0.5"
CARRYING COOLING COIL		SPACE		4.0" AND LARGER	0.75"
CONDENSATE					
		EXTERIOR	J2	3.0" AND SMALLER	0.5"
STORM WATER HORIZONTAL PIPING				4.0" AND LARGER	0.75"
FROM DRAIN TO RISER					
		EQUIPMENT ROOMS	J1	3.0" AND SMALLER	0.5"
		BELOW 7.0" ABOVE FLOOR		4.0" AND LARGER	0.75"
HOT PIPING					
DOMESTIC HOT WATER	P1	INTERIOR CONCEALED	--	0.5" AND SMALLER	0.5"
				1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		INTERIOR EXPOSED		0.5" AND SMALLER	0.5"
				1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		UNCONDITIONED	--	0.5" AND SMALLER	0.5"
		SPACE		1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
		EXTERIOR		0.5" AND SMALLER	1.0"
				1.0" THROUGH 2.0"	1.5"
				2.5" AND LARGER	2.0"
		EQUIPMENT ROOMS	J1	0.5" AND SMALLER	0.5"

		BELOW 7.0" ABOVE FLOOR		1.0" THROUGH 2.0"	1.0"
				2.5" AND LARGER	1.5"
DOMESTIC HOT WATER AND DRAIN AT HANDICAP LAVATORIES	P3				

END OF SECTION 22 0086

SECTION 22 0090

SUPPORTS, HANGERS AND ANCHORS

PART 1 GENERAL

1.01. WORK INCLUDED

A. Inserts, Anchors, and Upper Attachments

B. Pipe Hangers, Rods, Supports, and Accessories

C. Fabricated Steel Support

1.02. QUALITY ASSURANCE

A. Design of pipe supporting elements shall be in accordance with ANSI B31.1

B. Fabrication and installation of pipe hangers and supports shall be in accordance with the following Manufacturers Standardization Society (MSS) Standards:

1. SP-58 Pipe Hangers and Supports: Materials, Design and Manufacture.

2. SP-69 Pipe Hangers and Supports: Selection and Application.

3. SP-89 Pipe Hangers and Supports: Fabrication and Installation Practices.

C. Steel angles, channels and plate shall be in accordance with ASTM A36, red primed or hot dipped galvanized for interior applications and hot galvanized for exterior applications.

D. Bolts, including nuts and washers, used for fabricating steel members shall be in accordance with ASTM A325 and shall be stainless steel or plated for corrosion protection. Plain steel components are unacceptable.

E. Welding of steel members shall be in accordance with AWS D1.1.

F. Steel supports for ducts, pipe anchors, pipe guides, and piping supported from below shall be fabricated in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for buildings. If required, the Contractor shall include the cost of the services of a structural engineer to design or review the system.

1.03. APPLICABLE PUBLICATIONS

A. Applicable sections of the publications listed below form a part of this Section. The publications are referenced by the basic designation only.

1. American Institute of Steel Construction (AISC)

2. American National Standards Institute (ANSI)

3. American Society for Testing and Materials (ASTM)

4. American Welding Society (AWS)

5. The Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)

6. National Fire Protection Agency (NFPA)

7. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)

1.04. SUBMITTALS

A. Submit schedule indicating type of hanger to be used by system and pipe size. Include rod size for each hanger size.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Provide shop drawings for fabricated steel supports.

PART 2 PRODUCTS

2.01. ACCEPTABLE MANUFACTURERS

A. Inserts, Anchors, and Upper Attachments:

1. Anvil International, Inc.

2. Carpenter Paterson, Inc.

3. Cooper B-Line, Inc.

4. Elecen Metal Products

5. Hilti

6. Unistrut

7. ITW Red Head

B. Pipe Hangers, Rods, Supports and Accessories:

1. Anvil International, Inc.

2. Carpenter Paterson, Inc.

3. Cooper B-Line, Inc.

4. Elcen Metal Products

5. Hilti

6. Unistrut

C. Fabricated Steel Support: As indicated on Drawings.

2.02. DESIGN REQUIREMENTS

A. Supports capable of supporting the pipe for all service and testing conditions. Provide 4-to-1 safety factor.

B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.

C. Design supports and hangers to allow for proper pitch of pipes.

D. For chemical and waste piping, design, materials of construction, and installation of pipe hangers, supports, guides, restraints, and anchors:

1. ASME B31.3.

2. MSS SP-58 and MSS SP-69.

3. Except where modified by this Specification.

E. For steam and hot and cold water piping, design, materials of construction and installation pipe hangers, supports, guides, restraints and anchors:

1. ASME B31.1

2. MSS SP-58 and MSS SP-69.

F. Check all physical clearances between piping, support system, and structure. Provide for vertical adjustment after erection.

G. Support vertical pipe runs in pipe chases at base of riser. Support pipes for lateral movement with clamps or brackets.

H. Place hangers on outside of pipe insulation. Use a pipe covering protection saddle for insulated pipe at support point.

I. Fabricated Steel Supports: As detailed on the drawings.

2.03. INSERTS AND ANCHORS

A. Inserts: MSS Type 18; malleable iron body and nut, galvanized finish, opening in top of insert for reinforcing rod, lateral adjustable.

B. Anchors: Steel shell and expander plug, snap off end fastener

2.04. HORIZONTAL PIPING HANGERS AND SUPPORTS

A. Select size of hangers and supports to exactly fit pipe size for bare piping, and around piping insulation with saddle or shield for insulated piping.

B. For suspension of non-insulated or insulated stationary pipe lines: Adjustable steel clevices, MSS Type I.

C. For suspension of non-insulated stationary pipe lines: Adjustable band hangers, MSS Type 7 or 9; or split pipe rings, MSS Type II.

D. For support of piping where horizontal movement due to expansion and contraction may occur, and where a low coefficient of friction is desired: Pipe slides and slide plates, MSS Type 35, including guided plate mounted on a concrete pedestal or structural steel support.

E. For support from floor stanchion, using floor flange to secure stanchion to floor: Adjustable pipe stanchion saddles, MSS Type 37 or 38, including steel pipe base support and cast-iron floor flange.

F. For suspension of pipe from two (2) rods where longitudinal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

G. For suspension of pipe from a single rod where horizontal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

H. For support of pipe from a single rod where vertical adjustment is not necessary: Pipe roll stands, MSS Type 45.

I. For support of pipe where small horizontal movement due to expansion and contraction may occur, but vertical adjustment is not necessary: Pipe rolls and plates, MSS Type 45.

J. For support of pipe lines where vertical and lateral adjustment during installation may be required in addition to provision for expansion and contraction: Adjustment pipe rolls stands, MSS Type 46.

2.05. VERTICAL PIPING CLAMPS

A. Select size of vertical piping clamps to exactly fit size of bare pipe.

B. For support and steadying of pipe risers: Two-bolt riser clamps, MSS Type 8 or 42.

2.06. HANGER ROD ATTACHMENTS

A. Select size of hanger rod attachments to suit hanger rods.

B. For adjustment up to six (6) inches for heavy loads: Steel turnbuckles, MSS Type 13.

C. For use on high temperature piping installations: Steel clevices, MSS Type 14.

D. For use with split pipe rings, MSS Type II: Swivel turnbuckles, MSS Type15.

E. For attaching hanger rod to various types of building attachments: Malleable iron sockets, MSS Type 16 or 17.

F. Rods:

1. Size 3/8" and up: All thread steel rod electro galvanized. Sizing for pipe or equipment support as follows:

Copper Tube, Plastic	Steel, Cast Iron		
Pipe Size (Copper, Plastic)	Pipe Size (Steel, Cast Iron)	Rod Size	Max. Equip. Load

1/4" to 2"	1/4" to 2"	3/8"	730 lbs.
2-1/2" to 4"	2-1/2" to 3"	1/2"	1,350 lbs.
6"	4"	5/8"	2,160 lbs.
8" to 12"	6"	3/4"	3,230 lbs.
14"	8" to 12"	7/8"	4,480 lbs.
16"	14" to 16"	1"	5,900 lbs.
18" to 20"	18" to 20"	1-1/4"	9,500 lbs.
22" to 42"	22" to 42"	1-1/2"	13,800 lbs.

2. Rods may be reduced one size for double rod hangers with 3/8" minimum diameter, or when other paragraphs require a minimum of 2 hangers per section, provided the minimum diameter of 3/8" is maintained.

G. For upper attachment for suspending pipe hangers from concrete: Concrete inserts MSS Type 18.

H. For attachment to top flange of structural shape: Top beam C-clamps, MSS Type 19.

I. For attachment to bottom flange of structural shape: Side beam or channel clamps, MSS Type 20 or 27.

J. For attachment to center of bottom flange of beams: Center beam clamps, MSS Type 21.

K. For attachment to bottom of beams where heavy loads are encountered and hanger rod sizes are large: Welded attachments, MSS Type 22.

L. For attachment to structural shapes: C-clamps, MSS Type 23.

M. For attachment to top of beams when hanger rod is required tangent to edge of flange: Top I-beams clamps, MSS Type 25.

N. For attachment to bottom of steel I-beams for heavy loads: Steel I-beam/WF-beam clamps with eye nut, MSS Type 28 or 29.

O. Steel brackets, for indicated loading:

1. Light duty, 750 pounds, MSS Type 31.

2. Medium duty, 1,500 pounds, MSS Type 32.

3. Heavy duty, 3,000 pounds, MSS Type 33.

P. For use on sides of steel beams: Side beam brackets, MSS Type 34.

2.07. SPRING HANGERS AND SUPPORTS

A. Select spring hangers and supports to suit pipe size and loading.

B. For control of piping movement: Restraint control devices, MSS Type 47.

C. For light loads where vertical movement does not exceed 1-1/4 inch: Springs cushion hangers, MSS Type 48.

D. For equipping Type 41 roll hanger with springs: Spring cushion roll hangers, MSS Type 49.

E. For retardation of sway or thermal expansion in piping systems: Spring way braces, MSS Type 50.

F. For absorbing expansion and contraction of piping system from hanger: Variable spring hangers, MSS Type 51; preset to indicated load and limit variability factor to 25%.

G. For absorbing expansion and contraction of piping system from base support: Variable spring base supports, MSS Type 52; preset to indicated load and limit variability factor to 25%; include flange.

H. For absorbing expansion and contraction of piping system from trapeze support: Variable spring trapeze hangers, MSS Type 53; preset to indicated load and limit variability factor to 25%.

I. Constant supports: Provide one of the following types, selected to suit piping system. Include auxiliary stops for erection and hydrostatic test, and field load-adjustment capability.

1. Horizontal Type: MSS Type 54.

2. Vertical Type: MSS Type 55.

3. Trapeze Type: MSS Type 56.

2.08. SUPPLEMENTARY SUPPORTS

A. Where support spacing is more frequent than distance between structural members, provide steel angles, channels or beams sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer pipe support loads to structural members.

B. Where deflection of center of trapeze support exceeds 1/240 of distance between hanger rods, provide additional hanger rods.

C. Where multiple risers are supported within shafts, provide steel angles, channels or beams, sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer loads to the concrete floor slab. Anchor supplemental supports to the slab, and provide resilient element where required by other Sections of this Division.

2.09. ACCESSORIES

A. Protective Shields, MSS Type 40: Carbon steel, galvanized minimum of 12" length sized for required insulation.

B. Protective Saddles, MSS Type 39: Carbon steel plate, minimum of 12" length, sized for required insulation.

C. Steel Turnbuckle, MSS Type 13: Forges steel, galvanized finish with locknuts. Rated at a minimum of 730 lbs. at 3/8" size.

D. Steel Clevis, MSS Type 14: Forged steel, galvanized finish with steel pin and cotter pin. Rated for a minimum of 730 lbs. at 3/8" size.

E. Weldless Eye Nut, MSS Type 17: Forges steel, galvanized finish. Rated for a minimum of 730 lbs. at 3/8" size.

2.10. PIPE INSULATION HANGER SHIELDS

A. Where hangers are placed outside the jackets of pipe insulation, provide shields equal to "Thermal Hanger Shields" as manufactured by Pipe Shields, Inc. or equivalent by Elcen Metal Products Company.

B. Shields shall consist of a 360-degree insert of high-density, 100 psi, waterproof calcium silicate,

encased in a 360-degree galvanized sheet steel shield. Insert shall be same thickness as adjoining pipe insulation, and shall extend 1 inch beyond sheet metal shield in each direction on cold lines. Shield lengths and minimum sheet metal gauges shall be as directed below:

PIPE SIZE	SHIELD LENGTH	MINIMUM GAUGE
1/2" to 1-1/2"	4"	26
2" to 6"	6"	20
8" to 10"	9"	16
12" to 18"	12"	16
20" & Larger	18"	16

C. Shields shall be Model CS-CW, except for pipe roller applications: then provide Model CSX-CW.

D. At the Contractor's option, shop-fabricated galvanized metal shields may be provided based on approved shop drawings. Length and gauge of sheet metal shall be as specified above.

E. For all insulated piping 4” and larger, provide insulation insert at a minimum of 12” long. Insert shall extend a minimum of one inch beyond shield. Insulation inserts shall be minimum 12” long section of foam glass insulation.

2.11. METAL FRAMING: Provide products compliant with NEMA ML-1.

2.12. STEEL PLATES, SHAPES AND BARS: Provide products compliant with ANSI/ASTM A-36.

2.13. PIPE GUIDES: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base, with a two-section guiding spider bolted tight to pipe or as shown on Drawings. Size guides and spiders to clear pipe, cylinder and insulation, if any. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 EXECUTION

3.01. GENERAL REQUIREMENTS

A. Where applicable, install in accordance with the manufacturer's written installation instructions.

B. Where supports are in contact with copper pipe, provide copper plated support.

C. Where supports are in contact with glass, aluminum or brass pipe, provide plastic coating on supports.

D. Interior hangers, supports, including attachments, that are plain steel shall be primed and painted.

E. Hangers and supports, including attachments, exposed to weather or located in utility tunnels or accessible utility trenches or subject to spillage shall be hot dip galvanized after fabrication.

F. Fabricated steel supports exposed to weather or located in utility tunnels and accessible utility trenches or subject to spillage shall be primed and painted. Cut, welded, drilled or otherwise damaged surfaces of coating shall be repaired.

3.02. PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies

including but not limited to proper placement of inserts, anchors and other building structural attachments.

3.03. INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers, supports, clamps and attachments to support piping properly from building structure in compliance with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together in trapeze-type hangers where possible. Install supports with maximum spacing as specified in this Section. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for small diameter pipe. Do no use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Support fire protection water piping independently of other piping

D. The location of hangers and supports shall be coordinated with the structural work to ensure that the structural members will support the intended load.

E. Provide hex head nut on rod at top and bottom of clevis hanger yoke, and at each rod connection to intermediate und upper attachment. Rod nuts shall be securely locked in place.

F. Hanger rods shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing.

G. Hangers shall be fabricated to permit adequate adjustment after erection while still supporting the load. Turnbuckles shall be provided where required for vertical adjustment of the piping.

H. Supports for vertical piping shall be located at each floor or at intervals of not more than 15 feet and at intervals of not more than 8 feet from end of risers. Where supports are provided on intermediate floors spaced 15 feet or less between floors, no additional supports are required other than those specified for end of risers.

I. A hanger or support shall be provided adjacent to each piece of equipment to ensure that none of the pipe weight is supported from the equipment.

J. Provide protective shields on all piping required to be insulated.

K. Provide protective saddles sized to match insulation thickness on all hot piping required to be insulated. Fill void between saddle and pipe with insulation as specified.

L. Provide turnbuckles on all hangers that require leveling or aligning.

M. Provide steel clevis where detailed and/or required.

N. Provide weldless eye nuts on hanger terminations where disassembly or swing may be required. Use in combination with steel clevis.

O. Supports

1. Provide additional supports at:

a. Changes in direction.

b. Branch piping and runouts over 5 feet.

c. Concentrated loads due to valves, strainers and similar items.

d. At valves 4 inches and larger in horizontal piping.

e. Support piping on each side of valve.

f. Brace hubless piping to prevent horizontal and vertical movement.

g. Where number of grooved couplings exceeds 3 between supports or provide continuous steel between supports.

2. Sanitary waste and vent, roof drains per UPC Section 316: Vertical supports are not required within 2.5 feet of wall penetrations for pipes 8 inches in diameter and smaller, and not more than 3 feet for 10 inches and larger.

3. Other piping support spacing shall be as scheduled on Drawing or as required by referenced standard.

3.04. HANGER SPACING

A. The maximum spacing between pipe supports for straight runs shall be in accordance with the following chart. If any deviation from the table exists within the manufacturer's written installation instruction, whichever spacing reflecting the smaller centerline to centerline dimension shall be used.

MAXIMUM HORIZONTAL PIPE HANGER AND SUPPORT SPACING TABLE

1. Steel Pipe (Schedule 40 & 80):
Up to 1" ..... 7 ft. on center
1-1/4" and greater ..... 10 ft. on center

2. Copper Pipe (Types L, K and M):
Up to 1" size: ..... 5 ft. on center
1-1/4" to 2-1/2" ..... 7 ft. on center
3" and larger ..... 10 ft. on center

3. Ductile Iron and Cast Iron: Two hangers per section length.

4. Polyvinyl Chloride (PVC):
Up to 1-1/2" ..... 3 ft. on center
2" to 4" ..... 4 ft. on center
5" to 8" ..... 5 ft. on center
10" and larger ..... 6 ft. on center

5. Sprinkler and Standpipe: Pipe hangers to be as per NFPA-13 and NFPA-14 standards.

B. Hanger centerline spacing shall be reduced by 50% in areas of concentrated valves and/or fittings, also no more than a maximum distance of 12 inches from valves, fittings and/or couplings, or 24 inches from a change in direction.

3.05. ATTACHMENT TO STRUCTURE

A. For plain steel devices, prime and paint.

B. Adjust attachment location for proper alignment and no more than 4 degrees offset from a perpendicular alignment.

C. If proper alignment cannot be achieved from the existing building structure, provide a trapeze type support sized to handle the design load with a minimum safety factor of 5.

3.06. INSERTS

A. Contractor shall have inserts at site and dimensional location drawings ready at the beginning of the involved concrete work.

B. Install inserts by securing to concrete forms and inserting reinforcing rod through the opening provided in the insert in accordance with shop drawings.

C. Provide necessary supervision while concrete is being poured to correct any misalignment caused by the concrete.

3.07. INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B-31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bards to piping and to structure. Comply with ANSI B-31, with AWS standards, and with the Details shown on the drawings.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required, accommodating both expansion and contraction of piping.

E. Size anchor shell length to assure a minimum of 1" solid concrete remaining from shell and to concrete face.

3.08. INSTALLATION OF TRAPEZES OR PIPE RACKS

A. Light/Medium Duty: Assemble from standard manufactured metal framing systems, in accordance with manufacturer's recommendations.

B. Heavy Duty: Fabricate from structural steel shapes selected for loads required. Weld steel in accordance with AWS standards.

3.09. AUXILIARY STEEL

A. Furnish all miscellaneous structural members necessary to hang or support ductwork, piping, and mechanical equipment.

B. Notify Engineer of any adjustment necessary in main structural system for proper support of major equipment.

C. Fabricated Steel Supports: Steel for supports shall be saw cut, with sharp edges ground smooth. After fabrication, remove all foreign material, including welding slag and spatter, and leave ready for painting.

END OF SECTION

SECTION 22 01 10

BASIC VALVES

PART 1 - GENERAL

1.01 Valves specified in this section are for general use. See specifications for specific systems and special valves.

1.02 SUBMITTALS

A. Product Data: Provide for each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories. Provide valve schedule with product data listing valves used for each service application.

1.03 QUALITY ASSURANCE:

A. Single Source Responsibility: Where possible valves shall be by the same manufacturer.

B. MSS Standard Practices: Comply with the MSS standards for valves specified.

C. ASME: Comply with ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.

D. NSF: Comply with NSF 61 for valve materials for potable water service.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Preparation for Transport:

1. Ensure valves are dry and internally protected against rusting and galvanic corrosion.

2. Protect valve ends against mechanical damage to threads, flange faces, and weld end preps.

3. Set valves in best position for handling. Globe and gate valves shall be closed to prevent rattling; plug valves shall be open to minimize exposure of functional surfaces; butterfly valves shall be shipped closed or slightly open; and swing check valves shall be blocked in either closed or open position.

B. Storage:

1. Do not remove valve end protectors unless necessary for inspection; reinstall for storage.

2. Protect valves against weather. Where practical store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement and protect in watertight enclosures.

C. Handling: Valves whose size requires handling by crane or lift shall be slung or rigged to avoid damage to exposed valve parts. Handwheels and stems, in particular, shall not be used as lifting or rigging points.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering valves which may be incorporated in the work include the following. For majority of valves, Milwaukee has been used as basis of design. Equal valves of other manufacturers may be submitted without substitution requests.

1. APCO
2. Apollo
3. CPV
4. Crane
5. DeZurick
6. Grinnell
7. Hammond
8. Jamesbury
9. Jenkins
10. Keflex
11. Metraflex
12. Milwaukee
13. Mueller
14. Nibco
15. Nordstrom
16. Powell
17. Stockham
18. Walworth
19. Watts

2.02 VALVE FEATURES:

A. Valve Design: Valves shall have rising stem, or rising outside screw and yoke stems; except, non-rising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: Not less than indicated and required to suit system pressures and temperatures.

C. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.

D. Operators: Provide the following special operator features:

1. Handwheels, fastened to valve stem, for valves other than quarter turn.

2. Lever handle on quarter-turn valves 4 inch and smaller, except for plug valves. Provide one wrench for every 10 plug valves.

3. Chain-wheel operators for valves 2-1/2 inch and larger installed 72 inches or higher above finished floor elevation. Extend chains to an elevation of 5'-0" above finished floor elevation.

4. Gear drive operators on quarter-turn valves 6 inches and larger.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Provide bypass and drain connections required by manufacturer and as indicated on the drawings.

G. End Connections: As specified in the individual valve specifications.

1. Threads: Comply with ANSI B1.20.1.

2. Flanges: Comply with ANSI B16.1 for cast iron, ANSI B16.5 for steel, and ANSI B16.24 for bronze valves.

H. Valves for Domestic Hot Water and Cold Water.

1. Gate Valves:

a. 2 inch and Smaller: Class 125, body and bonnet of ASTM B62 cast bronze, threaded ends, solid disc, copper-silicon alloy stem, brass packing gland, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires. Milwaukee #105.

b. 2-1/2 Inch and Larger: Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and packing gland assembly. Milwaukee #F-2885A.

2. Ball Valves:

a. Valves 2 Inches and Smaller: Threaded ends, rated for 400 psi WOG pressure; 3 piece construction, bronze body conforming to ASTM B 62, full port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide insulator type handle for chilled water and condensate drain. Milwaukee BA-300.

3. Plug Valves:

a. 2 Inch and Smaller: 150 psi WOG, bronze body, straightaway pattern, square head, threaded ends. Lunkenheimer 454.

b. 2-1/2 Inch and Larger: 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends. Nordstrom 143.

4. Globe Valves:

a. 2 Inch and Smaller: Class 125, body and screwed bonnet of ASTM B 62 cast bronze, threaded ends, brass or replaceable composition disc, copper-silicon alloy stem, brass packing gland, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires. Milwaukee #502T.

b. 2-1/2 Inch and Larger: Class 125 iron body and bolted bonnet conforming to ASTM A 126, Class B; outside screw and yoke, bronze mounted, flanged ends, and packing gland assembly. Milwaukee F2981A.

5. Butterfly Valves: 2-1/2 Inch and Larger: 200 psi, cast iron body conforming to ASTM A 126, Class B. Valves shall have field replaceable EPDM sleeve, with nickel-plated ductile iron disc (except valves installed in condenser water piping which shall have aluminum bronze disc), stainless steel stem, and EPDM O-ring stem seals. Valves shall have gear operator with extended wheel handle and position indicator. Valves shall be lug type, drilled and tapped. Valves shall be suitable for dead end service, Class I, tight shut off. Milwaukee CL 223E.

6. Check Valves:

a. Swing Check Valves:

1. 2 Inch and Smaller: Class 125, cast bronze body and cap conforming to ASTM B 62, horizontal swing, Y-pattern, with a bronze disc, and having threaded ends. Valve shall be capable of being reground while the valve remains in the line. Class 150 valves meeting the above specifications may be used where pressure requires or Class 125 are not available. Milwaukee #509.

2. 2-1/2 Inch and Larger: Class 125 (Class 175 FM approved for fire protection piping systems), cast iron body and bolted cap conforming to ASTM A 126, Class B; horizontal swing, with a bronze disc or cast iron disc with bronze disc ring, and flanged ends. Valve shall be capable of being refitted while the valve remains in the line. Milwaukee #F2974A.

b. Spring Loaded (Non-Slam Check Valves for Pumps: Valves shall be iron body, globe typed silent check valves, bronze mounted, stainless steel spring with flanged (125-pounds drilling) end connections for installation between ASA 150 lbs. flat face steel slip on weld flanges. Valves shall be comparable to Mueller #105-AP, APCO Series 600, CPV Globe Type Silent Check Valve, Kelflex K-Check Silent Check Valve, or Metraflex Globe Style Silent Check Valve.

PART 3 – EXECUTION

3.01 EXAMINATION:

A. Examine piping systems for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Examine valve interior, threads, and flanges for cleanliness, and signs of damage or corrosion. Remove all shipping materials.

C. Actuate valve through an open-close cycle to determine if operation is proper.

D. Examine the piping for cleanliness and alignment.

E. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gaskets are of proper size, that material composition is suitable for service, and are free from defect.

F. Do not attempt to repair a defective valve. Replace all defective valves with new valves.

3.02 VALVE SELECTION:

A. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select valves with the following ends or types of pipe/tube connections:

1. Copper Tube Size 2 Inch and Smaller: Threaded ends.

2. Steel Pipe Sizes 2 Inch and Smaller: Threaded ends.

3. Steel Pipe Sizes 2-1/2 Inch and Larger: Flanged.

B. Ball valves may be used in lieu of gate valves for piping 2” and smaller except in steam and condensate return systems. Use gate valves for piping 2-1/2” and larger in size.

3.03 VALVE INSTALLATIONS:

A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.

B. Valves shall be located in an accessible position or made accessible through access panel.

C. Where several valves are related as to function, they shall be grouped in a battery.

D. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shutdown. Unions are not required on flanged devices.

E. Install a valved bypass around each pressure reducing valve using a globe valve for throttling.

F. Installation of check valves:

1. Swing Check Valves: Install in horizontal position with hinge pin level.

2. Wafer Check Valves: Install between two flanges in horizontal or vertical position.

3. Lift Check Valves: Install in piping with stem upright and plumb.

G. No valve shall be installed with stem below horizontal position without prior approval.

H. Provide special handles or operators as required or as indicated on the drawings.

I. Valves specified under specific systems shall take precedence over those as specified herein.

J. Valves in copper pipe shall have threaded ends (except where size dictates flanged ends), use copper to MPT adapters as required.

K. Provide non-slam type check valves at pumps.

3.04 FIELD QUALITY CONTROL:

A. Testing: After piping systems have been tested and put into service but before final adjusting and balancing, inspect each valve for leaks. Adjust or replace packing to stop leaks; replace valve if leak persists.

3.05 ADJUSTING AND CLEANING:

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare to receive finish painting or insulation.

3.06 VALVE BOXES

A. Valves located below slabs or grade shall be housed in cast iron boxes and covers. Covers shall be properly identified as to service controlled by the valves.

B. Furnish Owner with proper key or valve operator extension.

END OF SECTION

SECTION 22140

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for pipe and pipe fittings.

1.02 REFERENCE STANDARDS

A. ANSI A21.4

B. ANSI A21.11

C. ANSI A21.51

D. ANSI B16.3 Malleable Iron Threaded Fittings

E. ANSI B16.4 Cast Iron Threaded Fittings

F. ANSI B16.5 Pipe Flanges and Flanged Fittings

G. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

H. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings–DWV

I. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

J. ASTM A105 Forgings, Carbon Steel, for Piping Components

K. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

L. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

M. ASTM A536 Ductile Iron Castings

N. ASTM B32 Solder Metal

O. ASTM B88 Seamless Copper Water Tube

P. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

Q. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

R. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

S. ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

T. ASTM D2464 Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

U. ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

V. ASTM D2513 Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

W. ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

X. ASTM D2657 Heat Fusion Joining of Polyolefin Pipe and Fittings

Y. ASTM D2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

Z. ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

AA. ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

BB. ASTM D3222 Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials

CC. ASTM D4101 Propylene Plastic Injection and Extrusion Materials

DD. ASTM F437 Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80

EE. ASTM F438 Socket Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 40

FF. ASTM F441 Chlorinated Poly Vinyl Chloride (CPVC Plastic Pipe, Schedules 40 and 80

GG. ASTM F493 Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings

HH. ASTM F656 Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

II. ASTM F1476 Performance of Gasketed Mechanical Couplings for Use in Piping Applications

JJ. AWS A5.8 Brazing Filler Metal

KK. AWWA C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water

LL. AWWA C105 Polyethylene Encasement for Ductile Iron Piping for Water

MM. AWWA C110 Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids

NN. AWWA C111 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings

OO. AWWA C151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids

PP. AWWA C153 Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids

QQ. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances

RR. AWWA C606 Grooved and Shouldered Joints

SS. AWWA C651 Disinfecting Water Mains

TT. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

1.03 SUBMITTALS

A. Provide schedule indicating the ASTM or AWWA specification number of the pipe being proposed along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

B. Provide statement from manufacturer that pipe furnished meets the ASTM or specification contained in this section.

C. Grooved joint couplings and fittings shall be shown on product submittals, and shall be specifically identified with the applicable style or series designation.

1.04 QUALITY ASSURANCE

A. Pipe materials shall bear label, stamp, or other markings of specific testing agency.

B. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.

C. All castings used for coupling housings, fittings, and valve bodies shall be date stamped for quality assurance and traceability.

D. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.06 SYSTEM CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM or AWWA specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

D. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

E. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER

A. ABOVE GROUND:

1. Type L copper water tube, H (drawn) temper, ASTM B88;

   a. Solder joint; wrought copper ASME B16.22 pressure fittings; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

   b. Press-connect; ASME B16.51 cast copper alloy, wrought copper, and wrought copper alloy press-connect pressure fittings, EPDM O-rings.

2. (Water Service Entrance) Ductile iron pipe, thickness Class 53, AWWA C151/C115; with standard thickness cement mortar lining, AWWA C104; ductile iron mechanical grooved cement mortar lined fittings and couplings on cut grooved pipe, Class 350 12" and below, Class 250 above 12", AWWA C606; ductile iron or gray iron flanged cement mortar lined fittings, Class 250, AWWA C110; rubber gasket joints with non-toxic gasket lubricant, AWWA C111.

B. BELOW GROUND 2-1/2" AND SMALLER: Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ASME B16.18; wrought copper pressure fittings, ASME B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ASME B16.26.

C. BELOW GROUND 3" AND LARGER:

1. Ductile iron pipe, mechanical or push on joint, thickness Class 52, AWWA C151; with standard thickness cement mortar lining, AWWA C104; ductile iron or gray iron mechanical joint cement mortar lined fittings, Class 250, AWWA C110; ductile iron mechanical joint compact fittings, Class 350, AWWA C153; rubber gasket joints with non-toxic gasket lubricant, AWWA C111. Provide 8 mil tube or sheet polyethylene encasement of iron pipe and pipe fittings, AWWA C105.

D. THRUST RESTRAINTS FOR UNDERGROUND PIPING: Asphaltic or epoxy coated ductile iron follower gland mechanical joint restraint with gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference, low alloy steel T-bolts and UL listing or Factory Mutual approval. For PVC pipe joint bells, use epoxy or primer coated ductile iron bell and serrated ring restraints or gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference with low alloy steel tie bolts. Restraint to have minimum pressure rating and safety factor equal to or greater than pressure rating and safety factor of pipe and be designed specifically for the pipe material it is applied on.

2.02 DIELECTRIC UNIONS AND FLANGES

A. Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

B. Victaulic Series 47, dielectric waterway fittings to 8”, threaded or grooved ends, electroplated steel or ductile iron casing, with inert thermosplastic lining having a pressure rating to 300 psig at 230 degrees F.

2.03 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be Teflon type. Treated paper gaskets are not acceptable.

B. 2" AND SMALLER STEEL:

1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping.

2. 2" AND SMALLER COPPER: ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

C. 2-1/2" AND LARGER STEEL: ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full-face gaskets. Use ANSI B16.1 flat face flanges with full face Teflon gaskets for mating with other flat face flanges on equipment. Gaskets shall be teflon type.

D. 2-1/2" AND LARGER COPPER: ANSI B15.24 Class 150 cast bronze flanges with full face teflon gaskets.

E. Fittings used on galvanized steel pipe to be ductile iron A536, with galvanized finish, ASTM A153. Fittings used on ductile iron pipe to be cement mortar lined ductile iron with coal tar coating, ASTM A536; conforming to requirements of AWWA C110/C153 and AWWA C606. Fittings used on copper tube to be copper tube dimensioned wrought copper ANSI B16.22 or cast bronze ASNI B16.18. Fittings used on stainless steel shall be ASTM A403 or factory fabricated ASTM A312.

F. Gaskets to be EPDM, ASTM D1330. Gaskets for hot water systems and dry pipe systems to be flush seal design. Heat treated carbon track bolts and nuts, ASTM A183, with zinc electroplated finish ASTM B633, or stainless steel ASTM F593.

G. Gaskets used on potable water systems shall be UL classified in accordance with ANSI/NSF-61 for potable water service.

H. Flange adapters to be ductile iron, ASTM A536; except at lug type butterfly valves where standard threaded flanges shall be used. Victaulic Style 741 (steel pipe), 341 (AWWA ductile iron pipe) or 641 (copper tubing).

PART 3 - EXECUTION

3.01 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.02 INSTALLATION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact

location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping. All piping shall be concealed in areas with ceilings.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

1. For water systems, use adequate numbers of Victaulic Style 77 flexible couplings in header piping to accommodate thermal growth and contraction, and for the elimination of expansion loops. (In accordance with Victaulic instructions and as approved by the Engineer). Where expansion loops are required, use Victaulic Style 77 couplings on the loops.

G. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.03 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

B. Grooved joints for copper tubing shall be made at copper tube dimensions. (Flaring of tube ends to accommodate alternate sized couplings is not permitted).

C. Join copper tube and press connect fittings with tools recommended by fitting manufacturer.

3.04 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.05 MECHANICAL JOINT PIPE CONNECTIONS

A. Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant.

Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

3.06 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.07 DOMESTIC WATER

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install exterior water piping below predicted frost level in accordance with State Plumbing Code, but in no case less than 3' bury depth to top of pipe. Maintain minimum of 8' horizontal distance between 2-1/2" and larger water piping and sanitary sewer piping. Maintain minimum of 30" horizontal and 12" vertical distance, water on top, between 2" and smaller water piping and sanitary sewer piping. Where water piping crosses a sanitary sewer, provide minimum 18" vertical clearance and waterproof PVC water pipe sleeve (reference sanitary sewer materials) sealed at both ends for distance of 10' from sewer in both directions.

C. Provide thrust restraints for 3" and larger exterior water piping joints, hydrants, caps, plugs, fittings and bends of 22-1/2 degrees or more. Field apply continuous anti-corrosion coating to rodded restraint components. Protect mechanical joints, nuts and bolts from concrete cover. Cover with 8 mil sheet or tube polyethylene material sleeve.

D. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

E. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration is no higher than source water level.

F. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.08 DIELECTRIC UNIONS AND FLANGES

A. Install dielectric unions, waterway fittings, or flanges at each point where a copper-to-steel pipe connection is required in domestic water systems.

3.09 UNIONS AND FLANGES

A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

B. Union and flanges for disconnect and servicing area not required in installations using grooved mechanical joint couplings. (The couplings shall serve as unions and disconnect points).

3.10 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the Owner's representative. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Below Ground Domestic Water	Water	N/A	200 psig 2 Hour
Above Ground Domestic Water	Water	N/A	100 psig 8 Hour
Above Ground Non-Potable Water	Water	N/A	100 psig 8 Hour
Below Ground Non-Potable Water	Water	N/A	100 psig 8 Hour

END OF SECTION

SECTION 22150

SANITARY WASTE AND VENT

PART 1 - GENERAL

1.01 SCOPE

A. This section contains specifications for sanitary waste and vent plumbing pipe and pipe fittings.

1.02 REFERENCE STANDARDS

ANSI A21.4

ANSI A21.11

ANSI A21.51

ANSI B16.3 Malleable Iron Threaded Fittings

ANSI B16.4 Cast Iron Threaded Fittings

ANSI B16.5 Pipe Flanges and Flanged Fittings

ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

ASTM A74 Cast Iron Soil Pipe and Fittings

ASTM A105 Forgings, Carbon Steel, for Piping Components

ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

ASTM A234 Pipe Fittings-Wrought Carbon Steel & Alloy Steel for Moderate & Elevated Temperatures

ASTM A861 High Silicon Iron Pipe and Fittings

ASTM A888 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

ASTM B32 Solder Metal

ASTM B88 Seamless Copper Water Tube

ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASTM B306 Copper Drainage Tube (DWV)

ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

ASTM C76 Reinforced Concrete Culvert, Storm Drain and Sanitary Pipe

ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings

ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

ASTM D2665 Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

ASTM D2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

ASTM D3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM D3222 Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials

ASTM D3311 Drain, Waste and Vent (DWV) Plastic Fitting Patterns

ASTM F2618 Standard Specification for Chlorinated Poly Vinyl Chloride (CPVC) Pipe and Fittings for Chemical Waste Drainage Systems.

AWS A5.8 Brazing Filler Metal

PART 2 - PRODUCTS

2.01 SANITARY WASTE AND VENT

A. INTERIOR ABOVE GROUND:

1. Solid Wall SCH 40 PVC pipe and fittings.

2. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

B. INTERIOR BELOW GROUND:

1. Solid Wall SCH 40 PVC or Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene rubber compression gaskets, ASTM C564.

C. EXTERIOR BELOW GROUND 15" AND SMALLER:

1. Solid Wall SCH 40 PVC or Cast iron soil pipe and fittings, ASTM A74; with neoprene rubber compression gaskets, ASTM C564.

2.02 SUBMITTALS

A. Provide schedule indicating the ASTM specification number of the pipe being proposed

along with its type and grade, and sufficient information to indicate the type and rating of fittings for each service.

B. Provide statement from manufacturer that pipe furnished meets the ASTM specification contained in this section.

2.03 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specific testing agencies.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

2.04 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

2.05 SYSTEM CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

D. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

E. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

F. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

PART 3 - EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer’s recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 INSTALLATION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

C. Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

D. Maintain piping in clean condition internally during construction.

E. Provide clearance for installation of insulation, access to valves and piping specialties.

F. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

G. Do not route piping through transformer vaults or above transformers, panel boards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

H. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.06 MECHANICAL HUBLESS PIPE CONNECTIONS

A. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturer's recommended torque.

3.07 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.08 SANITARY WASTE AND VENT

A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4" per foot for 2” and smaller piping and 1/8" per foot for piping 3" and larger.

B. Install exterior piping below predicted frost level and not less than 3 feet bury depth to top of pipe wherever possible.

C. Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

3.09 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. Entire test must be witnessed by the local authority having jurisdiction. All pressure tests are to be documented.

System	Test Medium	Initial Test Pressure Duration	Final Test Pressure Duration
Sanitary Waste & Vent	Water	N/A	10’ Water 2 Hour

END OF SECTION

SECTION 220160

NATURAL GAS SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. This section covers the complete natural gas system installation, within and to five (5) feet beyond building perimeter unless noted otherwise on Contract Drawings, including but not limited to piping, regulators, unions, valves, installation, testing and other normal parts that make the systems complete, operable, code compliant and acceptable to the authorities having jurisdiction.

1.2 REFERENCE STANDARDS

A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

D. 2015 Edition of the International Fuel Gas Code.

E. Latest Edition of NFPA 54, National Fuel Gas Code.

1.3 QUALITY ASSURANCE

A. All materials, equipment and Work shall meet or exceed all applicable federal, state and local requirements and conform to codes and ordinances of authorities having jurisdiction.

B. Valves: Manufacturer’s name, size, standards compliance and pressure rating clearly marked on outside of valve body.

C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

1.4 SUBMITTALS

A. Product Data:

B. Provide code and standards compliance verification, manufacturer's product data and ratings on pipe materials, pipe fittings, regulators, valves and accessories.

1.5 DELIVERY, STORAGE and HANDLING

A. Accept valves on Site in shipping containers with labeling in place, inspect for damage and store with a minimum of handling. Store plastic piping under cover out of direct sunlight. Do not store materials directly on the ground.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.6 EXTRA MATERIALS

A. Provide one (1) plug valve wrench for every ten (10) plug valves sized 2 inches and smaller, minimum of one. Provide each plug valve sized 2-1/2 inches and larger with a wrench incorporating a setscrew.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

B. Natural gas pressures shall not exceed five (5) pounds per square inch gauge on Owner's side of the meter.

C. Pipe joint compound shall be lead-free, non-toxic, non-hardening, insoluble in the presence of natural gas and compliant with ANSI/NSF 61 and Federal Specification TT-S-1732. Temperature service range of -15 degrees F to +400 degrees F, manufactured by Hercules "MegaLoc" or approved equal by Rectorseal, La-Co or Oatey.

2.2 PIPING

A. Buried Piping Outside of Building:

B. Polyethylene, SDR-11, ASTM D2513 pipe and fittings with heat fusion socket joints.

C. Polyethylene pipe and fitting materials shall be compatible and by same manufacturer to ensure uniform melting and a proper bond. Fabricated fittings shall not be used.

D. Provide connection between buried plastic gas service piping and metallic riser in accordance with the gas code. Provide metallic riser consisting of HDPE fused coating on steel pipe for connection to above ground building distribution piping. Underground horizontal metallic portion of riser shall be at least twenty four inches in length before connecting to the plastic service pipe. An approved transition fitting or adaptor meeting design pressure rating and plastic pipe manufacturers recommendations shall be used where the plastic joins the metallic riser.

E. Above Ground Piping Outside of Building (Including roof):

F. Piping 2 inches and smaller shall be seamless Schedule 40 black steel, ASTM A106 or ASTM A53 Type "S", Grade A or B, with Class 150 black malleable iron threaded fittings conforming to ASME B16.3.

G. Piping 2½ inches and larger shall be Type "S" seamless or Type "E" electric resistance welded Schedule 40 black steel, ASTM A53, Grade A or B, with Schedule 40 wrought carbon steel fittings, ASTM A 234 and butt weld joints.

H. Provide factory-applied, three-layer coating of epoxy, adhesive, and PE or field applied primer and epoxy paint coating on all pipe and fittings. Field applied coating is restricted to fittings and short sections of pipe necessarily stripped for threading or welding. Field coating shall be manufactured by Amercoat Type 240 or approved equal and applied in accordance with manufacturer's recommendations. Galvanizing shall not be considered adequate protection.

2.3 UNDERGROUND WARNING TAPE

A. Minimum 3 inch wide polyethylene detectable type marking tape. The tape shall be resistant to alkalis, acids and other destructive agents found in soil and impregnated with metal so that it can be readily recognized after burial by standard locating equipment.

B. Lamination bond of one (1) layer of Minimum 0.35 mils thick aluminum foil between two (2) layers of minimum 4.3 mils thick inert plastic film.

C. Minimum tensile strength: 63 LBS per 3 IN width.

D. Minimum elongation: 500 percent.

E. Provide continuous yellow with black letter printed message repeated every 16 to 36 inches warning of pipe buried below (e.g.: "CAUTION GAS LINE BURIED BELOW").

F. Manufactured by Reef Industries “Terra Tape” or approved equal.

2.4 VALVES

A. All valves shall be designed, manufactured and approved for natural gas service.

B. Line Shut-off Valves sizes 2 inches and smaller shall be iron body lubricated plug valve conforming to ASTM-A-126, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, wrench operation, rated for 200 WOG service pressure and –20 to 200 degrees F., manufactured by Resun Model R-1430, Nordstrom Model 142, or approved equal.

C. Line Shut-off Valves sizes 2½ inches and larger shall be iron body lubricated plug valve conforming to ASTM-A-126, U.L. Listed and A.G.A. Approved for natural gas service with flanged ends, wrench operation, rated for 200 WOG service pressure and –20 to 200 degrees F., manufactured by Resun Model R-143, Nordstrom Model 143, or approved equal.

D. Appliance/Equipment Shut-off Valves at local connections sizes 2 inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275 degrees F., manufactured by Nibco Model T585-70-UL, Model T580-70-UL, Milwaukee Model BB2-100, or approved equal.

E. Manual Emergency Shut-off Valves sizes 2 inches and smaller shall be bronze body, full port ball or butterfly type, U.L. Listed and A.G.A. Approved for natural gas service with threaded ends, quarter turn lever handle operation, rated for 175 W.O.G. service pressure and 30 to 275 degrees F., manufactured by Nibco Model T585-70-UL, Model T580-70-UL, Milwaukee Model BB2-100, or approved equal.

F. Automatic Emergency Shut-off Valves shall be U.L. Listed F.M. Approved for natural gas service, 2-way electrically tripped solenoid type; fail safe closed; manual reset; Type 1 solenoid enclosure; NBR seals and disc; stainless steel core tube and springs; copper coil; manufactured by ASCO Red Hat Series 8044, or approved equal.

2.5 PRESSURE REGULATORS

A. All pressure regulators shall be designed, manufactured and approved for natural gas service.

B. Pressure regulators for individual service lines shall be capable of reducing distribution line pressure to pressures required for users. Pressure relief shall be set at a lower pressure than would cause unsafe operation of any connected user. Regulator shall have a single port with orifice diameter no greater than that recommended by manufacturer for the maximum gas pressure at the regulator inlet. Regulator vent valve shall be of resilient materials designed to withstand flow conditions when pressed against valve port. Regulator shall be capable of limiting build-up of pressure under no-flow conditions to 50 percent or less of the discharge pressure maintained under flow conditions. Commercial grade diaphragm type with internal relief valve, vent valve, cast iron body, Buna-N diaphragm. Manufactured by Rockwell or Fisher.

C. Install pressure gauge adjacent to and downstream of each line pressure regulator.

2.6 UNIONS

A. Unions in 2 inches and smaller in ferrous lines shall be right and left hand nipple/coupling assembly, or ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends, 2-1/2 inches and larger shall be ground flange unions. Companion flanges on lines at various items of equipment, machines and pieces of apparatus may serve as unions to permit disconnection of piping.

B. Unions connecting ferrous pipe to copper or brass pipe shall be dielectric type.

C. Above grade flexible stainless steel appliance/equipment connectors shall conform with AGA under the ANSI Z21.69 Standard. Hose shall be braided stainless steel with a polyolefin heat-shrink tubing with high flame-retardant qualities. Hose shall be equipped with malleable iron unions and spring loaded brass quick-link couplings. An easily accessible manual shut-off valve shall be installed ahead of all hose connections. Specify T&S Brass "Safe-T-Link" or approved equal.

2.7 FLANGES

A. All 150 lb. and 300 lb. ANSI flanges shall be domestically manufactured, weld neck forged carbon steel, conforming to ANSI B16.5 and ASTM A-181 Grade I or II or A-105-71. Slip on flanges shall not be used. Each fitting shall be stamped as specified by ANSI B16.9 and, in addition, shall have the laboratory control number stenciled on each fitting for ready reference as to physical properties and chemical composition of the material. Flanges shall have the manufacturer’s trademark permanently identified in accordance with MSS SP-25. Bolts used shall be carbon steel bolts with semi-finished hexagon nuts of American Standard Heavy dimensions. Bolts shall have a tensile strength of 60,000 psi and an elastic limit of 30,000 psi. Flat-faced flanges shall be required to match flanges on check valves, strainers, and other valves and devices. Only one manufacturer of weld flanges will be approved.

B. All flanges shall be gasketed. Contractor shall place gasket between flanges of flanged joints. Gaskets shall fit within the bolt circle on raised face flanges and shall be full face on flat face flanges. Gaskets shall be cut from 1/16 inch thick, non metallic, non asbestos gasket material suitable for operating temperatures from -150 degrees F to +75 degrees F, Klingersil C-4400, Manville Style 60 service sheet packing, or equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe ends and remove cutting burrs. Bevel plain end ferrous pipe.

B. Remove cutting oil, scale and dirt, on inside and outside of piping, before assembly.

3.2 EQUIPMENT CONNECTIONS

A. Provide specified connections, shutoff valves, regulators and unions at each and every appliance and piece of equipment requiring natural gas.

B. Provide and install union type connections at all equipment to permit removal of service piping.

C. Gas service connections shall have a diameter at least one pipe size larger than that of the inlet connection to the equipment as provided by the manufacturer and be of adequate size to provide the total input demand of the connected equipment.

D. Provide listed and labeled appliance connectors complying with ANSI Z21.69 and listed for use with food service equipment having casters, or that is otherwise subject to movement for cleaning, and other large movable equipment. Connectors shall have listed and labeled quick-disconnect devices and shall have retaining cables attached to structures and equipment. Connectors shall not be concealed within or extended through wall, floor or partition and shall be located entirely in the same room as the connected equipment. Provide an accessible shut-off valve not less than the nominal size of the equipment connector, immediately ahead of the connector.

E. Rigid metallic pipe and fittings shall be used at service connections to all stationary equipment.

3.3 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer’s published recommendations.

C. Provide support for and connections to natural gas service meter in accordance with requirements of the utility company, when so indicated on the Drawings.

D. All installation shall be in accordance with manufacturer’s published recommendations.

E. Distribution piping shall be as short and as direct as practicable between the point of delivery and the outlets.

F. Do not install underground piping when bedding is wet or frozen.

G. Bury all underground piping at least 3 feet below finished grade. Provide a continuous detectable warning tape on tamped backfill, 12 inches above all buried non-metallic gas lines.

H. Do not install gas piping in the same trench with other utilities. The minimum horizontal clearance between gas pipe and parallel utility pipe shall be 2 feet. Do not install gas pipe through catch basins, vaults, manholes or similar underground structures.

I. Install and support all polyethylene piping in accordance with manufacturer's recommendations. All heat fusion welds shall be performed by welders qualified to the manufacturer’s procedures.

J. Polyethylene piping shall not be installed above ground.

K. Provide connection between buried plastic gas piping and metallic riser in accordance with the gas code.

L. All above ground gas piping shall be electrically continuous and bonded to electrical system ground conductor in accordance with NFPA 70.

M. Provide and install union type fittings at proper points to permit dismantling or removal of pipe. No unions will be required in welded lines except at equipment connections. Where union type fittings are necessary for piping dismantling purposes, right and left nipples and couplings shall be used. Flanges, ground-joint unions or approved flexible appliance connectors may be used at exposed fixture, appliance or equipment connections.

N. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric coupling or dielectric flange fitting.

O. Valves, regulators, flanges, union type fittings and similar appurtenances shall be accessible for operation and servicing and shall not be located above ceilings, within chases, walls/partitions, spaces utilized as return air plenums or non-accessible locations.

P. Route piping in orderly manner and maintain gradient. Install piping to conserve building space. Group piping whenever practical at common elevations.

Q. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

R. Make service connections at the top of the main, whenever the depth of the main is sufficient to allow top connections. When service connections cannot be made at the top of the main, they shall be made on the side of the main no lower than the horizontal midpoint of the gas main.

S. Close nipples, bushing and cross type fittings shall not be installed in any gas piping system.

T. Slope piping and arrange to drain at low points. Install drip/sediment traps at points where condensate and debris may collect. Locate drip/sediment traps where readily accessible for cleaning and emptying. Do not install where condensate would be subject to freezing. Construct drip/sediment traps using tee fitting with capped nipple connected to bottom outlet. Use minimum-length nipple of 3 pipe diameters, but not less than 4 inches long, and same size as connected pipe. Cap shall be screwed pattern, black, standard weight, malleable iron. Install with adequate space for removal of cap.

U. Install valves for shut off and to isolate equipment, parts of systems, or vertical risers. All valves shall be located such that servicing and operation is possible. All flanged valves shown in horizontal lines with the valve stem shall be positioned so that the valve stem is inclined one bolt hole above the horizontal position. Screw pattern valves placed in horizontal lines shall be installed with their valve stems inclined at an angle of a minimum of 30 degrees above the horizontal position. All valves must be true and straight at the time the system is tested and inspected for final acceptance.

V. Install line shut-off valve at each branch connection to riser.

W. Provide adequate clearance for access to and operation of all valves.

X. Install valves with stems upright or horizontal, not inverted unless required otherwise by the valve manufacturer.

Y. Pipe vents from gas pressure reducing valves and pipe casing sleeves to the exterior of the building and terminated with outlet turned down and capped with corrosion resistant insect screen. Vent terminations shall be at least seven feet above grade or pedestrian traffic and a minimum three (3) feet above or twenty-five (25) feet horizontally from all air intakes or building openings.

Z. Above ground horizontal natural gas and encasement piping shall be supported at intervals of no greater than 6 foot for 1/2 inch piping, 8 foot for 3/4 inch and 1 inch piping and 10 foot for 1-1/4 inches and larger piping. Vertical piping shall be supported at each floor level and at intervals as specified for horizontal piping.

AA. Extension bars shall not be used for supporting gas or encasement piping. Gas or encasement piping shall not be used to support any other piping or component.

BB. Provide piping and valve identification in accordance with Project Specification Section 20 05 53.

3.4 INSTALLATION OF WELDED PIPING

A. Welding of pipe in normally occupied buildings is prohibited. Off-Site welding is acceptable. Should welding be required in a normally occupied building for connecting to an existing welded system, obtain written approval from the Owner and comply with Owner's fire and life safety requirements.

B. Piping and fittings shall be welded and fabricated in accordance with ASME/ANSI the latest editions of Standard B32.1 for all systems from the Code for Pressure Piping. Machine beveling in shop is preferred. Field beveling may be done by flame cutting to recognized standards.

C. Ensure complete penetration of deposited metal with base metal. Provide filler metal suitable for use with base metal. Maintain inside of fittings free from globules of weld metal. All welded pipe joints shall be made by the fusion welding process, employing a metallic arc or gas welding process. All pipes shall have the ends beveled 37-½ inch degrees and all joints shall be aligned true before welding. Except as specified otherwise, all changes in direction, intersection of lines, reduction in pipe size and the like shall be made with factory-fabricated welding fittings. Mitering of pipe to form elbows, notching of straight runs to form tees, or any similar construction will not be permitted.

D. Align piping and equipment so that no part is offset more than 1/16 inch. Set all fittings and joints square and true and preserve alignment during welding operation. Use of alignment rods inside pipe is prohibited.

E. Contractor shall not permit any weld to project within the pipe so as to restrict it. Tack welds, if used, must be of the same material and made by the same procedure as the completed weld. Otherwise, remove tack welded during welding operation.

F. Do not split, bend, flatten or otherwise damage piping before, during or after installation.

G. Remove dirt, scale and other foreign matter from the inside of piping, by swabbing or flushing, prior to the connection of other piping sections, fittings, valves or equipment.

H. In no cases shall Schedule 40 pipe be welded with less than three passes including one stringer/root, one filler and one lacer. Schedule 80 pipe shall be welded with not less than four passes including one stringer/root, two filler and one lacer. In all cases, however, the weld must be filled before the cap weld is added.

3.5 TESTING

A. All natural gas systems shall be inspected, tested, purged and placed into operation in accordance with NFPA 54 and as required herein.

B. All necessary apparatus for conducting tests shall be furnished by the Contractor and comply with the requirements of NFPA 54.

C. All new rough-in distribution piping and affected portions of existing systems connected to, shall be subjected to a pneumatic test pressure utilizing clean, dry air and must be demonstrated to be absolutely tight when subjected to the pressures and time durations listed herein. All equipment and components designed for operating pressures of less than the test pressure shall not be connected to the piping system during test.

D. Systems on which the normal operating pressure is less than 0.5 pounds per square inch gauge (psig), the test pressure shall be 5.0 psig and the time interval shall be 30 minutes.

E. Systems on which the normal operating pressure is between 0.5 psig and 5.0 psig, the test pressure shall be 1.5 times the normal operating pressure or 5.0 psig, whichever is greater, and the time interval shall be 30 minutes.

F. Systems on which the normal operating pressure is 5.0 psig or greater, the test pressure shall be 1.5 times the normal operating pressure, and the time interval shall be one (1) hour.

G. After testing is complete, the entire gas system shall be purged with dry nitrogen to eliminate all air, debris and moisture from the piping before natural gas is introduced into the system.

H. After successful results of pressure test and purging have been completed, a leakage test shall be performed in accordance with NFPA 54 Appendix D.

I. Connect, inspect and purge gas utilization equipment, lab hook-ups and outlets, and place into operation only after successful results of pressure test, leakage test and purging have been completed and accepted.

J. Testing operations shall be repeated until gas-piping systems are absolutely tight at the pneumatic test pressures indicated above.

K. Pressure test gas piping sleeve system with clean, dry compressed air at 15 psig by temporarily sealing all openings between gas carrier pipe and sleeve and vent openings. Sleeve systems must be demonstrated to be absolutely tight when subjected to this pressure for a period of four hours.

END OF SECTION

SECTION 23 00 10

MECHANICAL GENERAL

PART 1 - GENERAL

1.01. CONTRACT DOCUMENTS

A. Drawings are diagrammatic, due to scale, and indicate the general arrangements and geometric relationships of equipment, systems, and services. They are not intended to show or indicate every offset, sequence, device, option, fitting, valve, or accessory. Plan work around building details and other crafts. Do not scale drawings for exact sizes and locations.

B. Contractor shall base all his measurements, both horizontal and vertical, from established benchmarks. All work shall agree with these established lines and levels. Contractor shall verify all measurements at site and check correctness as related to the work.

C. In case of interferences between trades, Engineer will decide which work is to take precedence regardless of work that might be installed.

1.02. CODES, ORDINANCES, INSPECTIONS AND PERMITS

A. Work is to be executed and inspected in accordance with local and State codes, laws, ordinances, rules and regulations applicable to particular class of work, including the State Mechanical Code, State Plumbing Code, State Gas Code, and State Fire Code. Associated fees shall be paid by the Contractor.

B. Should any part of drawings or specifications be found to be in conflict with applicable codes or ordinances, notify the Engineer, in writing, within 72 hours prior to bid deadline for review and/or correction of bid documents. After project bidding is closed, any discovery of code violations shall be promptly reported to the Engineer. Any work performed in violation of applicable codes or ordinances shall be corrected without additional expense to the Owner or his representatives.

C. Pressure and heating vessels, including hot water storage containers, shall be constructed in compliance with the rules and regulations of the Boiler Inspection Division of the State. All installations of such equipment shall be made by a firm licensed and approved by the Boiler Inspection Division of the State.

D. Facilities shall be installed in compliance with the requirements of the current version of the Americans with Disabilities Act (ADA). Installation of mechanical and plumbing systems including fixtures and control mounting heights, clear knee space, and access clearances shall comply with ADA required dimensions, and as shown on details or schedules when shown.

E. Contractor shall arrange with County, City or State, if City has no ordinances covering work, for complete inspection, paying all charges required. Give proper authority requisite notice relating the work; afford Engineer and authorized inspectors adequate access to the Work for inspection; and be responsible for all violations of law. Upon completion of work, have work inspected, if required, obtaining certificates of inspection and approval from inspecting agency and deliver certificates to Engineer and Owner.

1.03. REVIEW OF CONTRACT DOCUMENTS AND SITE

A. With the submission of his bid, Contractor shall give written notice to the Engineer of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules or regulations of Authorities having jurisdiction, and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that the Contractor has included the cost of all required items in his proposal for a complete project.

B. Contractor shall acknowledge that he has examined the Plans, Specifications, and Site, and that from his own investigation he has satisfied himself as to the nature and location of the work; the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage or materials; availability of labor, water, electric power, roads and uncertainties of weather; the confirmation and condition of the ground; the characters, quality and quantity of subsurface materials to be encountered; the character of equipment and facilities needed preliminary to and during the execution of the Work, especially the prohibited use of Owner's permanent equipment, ductwork, and controls; all federal, state, county, township and municipal laws, ordinances, and regulations particularly those relating to employment of labor, wage rates, and construction methods; and all other matters which can in any way affect the Work or the associated cost of the Work under this Contract. Any failure by the Contractor to acquaint himself with the available information concerning these conditions will not relieve him from the responsibility for estimating properly the difficulty or cost of successfully performing the work.

C. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.

1.04. USE OF THE OWNER'S EXISITNG AND NEW, PERMANENT HVAC SYSTEM DURING CONSTRUCTION

A. **Use of the Owner's existing and currently being installed, permanent HVAC system during Construction shall be allowed where equipment is protected by MERV 8, minimum, filtration from construction debris.**

B. **HVAC Equipment, Ductwork, and Control Components contaminated by construction debris, dirt, and construction dust shall not be acceptable and shall be cleaned, or replaced if necessary, at no additional cost to the Owner. HVAC Equipment, Ductwork, and Control components shall be kept clean throughout construction.**

C. Maintain a minimum ambient temperature of 50 DEG. F. in areas where construction is in progress, unless indicated otherwise in the specifications.

D. Prevent dust, fumes, construction debris, and odors from entering existing and newly installed HVAC equipment, ductwork, and control system components. Prior to commencing work, isolate HVAC equipment. Where existing HVAC systems will be affected, isolate existing supply, return, and exhaust ducts by disconnecting ductwork at point where existing duct shall remain. Cover ends of existing ductwork securely with black plastic material.

E. Newly installed ductwork shall be thoroughly cleaned before installation. Each section that is installed at the end of the day shall have open ends securely covered with black plastic material.

F. Newly installed HVAC equipment shall be securely covered and protected with black plastic material or by other approved method. After installation of air moving equipment, duct connections shall be securely covered with black plastic material. Connections to duct systems shall not be made until final finishes have been installed, areas served are clean, and building is ready for HVAC equipment start-up and use.

G. Securely cover control system components to prevent damage from construction debris, dust, and dirt. Control systems shall not be energized for testing and adjusting until HVAC system start-up.

1.05. SHOP DRAWINGS AND SUBMITTALS

A. Submit manufacturer's catalog sheets and/or shop drawings covering all phases of work included in this Contract.

B. Arrange submittals in sets and bind in PDF format. Loose sheets are not acceptable. Indicate for each item the location, system, or position where it is to be used, arrange by equipment type and tab sections.

1. Individual submittal packages may be made for plumbing, HVAC, fire protection, test and balance, and controls. The Contractor may submit up to 5 different packages, but where practical provide all submittals in a single PDF.

2. Items which are required to be resubmitted shall come in a single PDF. Approved equipment is not required to be resubmitted.

3. The Contractor is responsible for verification that all items are submitted.

C. Submittals shall bear written certification to the effect that the Contractor has examined them and found them to include all items required to be submitted and to be in accordance with specifications.

D. Submittals are required even though equipment being furnished is exactly as specified.

E. Submittals shall include all data required in individual sections of these specifications.

F. Contractor is responsible for making all submittals required by the specifications for approval. If equipment is delivered or installed without an approved submittal, Contractor may be required to remove and replace equipment with specified and approved equipment, as directed by the Engineer, without additional cost to the project.

G. Exceptions for Submittals

1. Exceptions to the Specifications or Drawings shall be clearly defined in a separate section of each submittal package. The submittal shall contain the reason for the exception, the exact nature of the exception and the proposed substitution so that a proper evaluation may be made by the Engineer. The acceptability of any device or methodology submitted as an “or equal” or

"exception" to the Specifications shall be at the sole discretion of the Engineer.

2. By noting the term "compliance", it shall be understood that the Contractor is in full compliance with the item specified and will provide exactly the same with no deviations.

3. By noting the term "deviation", it shall be understood that the Contractor prefers to provide a different component in lieu of the one specified and in so doing, takes full responsibility for making the equipment work as specified and will provide any and all ancillary components to make the equipment work at no extra cost to the Owner.

4. By noting the term "alternate", it shall be understood that the manufacturer proposes to provide the same operating function but prefers to do it in a different manner and in so doing, takes full responsibility for making the equipment work as specified and will provide necessary ancillary components to make the equipment work at no extra cost to the Owner. The alternate method shall be fully described with schematic diagrams and one-line diagrams as applicable.

1.06. SUBSTITUTION OF MATERIALS

A. Final decision as to whether or not a specific piece of equipment meets specifications shall rest with Engineer.

B. Substitution requests will not be accepted prior to bid.

C. Equipment and material manufacturers are referenced in the Plans and Specifications to establish the basis of design and required standards.

D. With each Substitution Request, submit technical data that will fully establish the equality of the proposed substitute product with that listed. Submit completed Substitution Request Form.

E. Substitution Process

1. The naming of a manufacturer's product with the words "basis of design" or the naming of a single manufacturer's product on a drawing equipment schedule, on other drawings, or in the specifications, establishes that specific product as the basis for design. In the absence of any other named acceptable manufacturer's product, provide the "basis of design" product. No substitutions will be accepted.

2. Where other manufacturer's names are listed on the drawings or in the specifications as acceptable in addition to the "basis of design" product, product acceptability for these manufacturers shall be verified via submittal review after the project has bid. No other substitutions will be accepted.

3. Where the words "include but shall not be limited to" or "or equal" are used in addition to a manufacturer's name or a list of manufacturer's names, product acceptability for these manufacturers shall be verified via submittal review after the project has bid.

4. It is the responsibility of the Contractor to provide all of the data necessary to establish acceptability of the product.

5. The submittal for the substitution will be reviewed for conformance with the specifications and equality to the specified products. Full submittals will be required of all equipment. Substitution submittals will be reviewed and shall be rejected if the proposed equipment is found to be different than indicated on the Substitution Request Form, or is found deficient compared to scheduled performance/or specifications.

F. Any proposed substitutions of equipment shall be accompanied by product submittal and shop drawings showing revised equipment layouts, piping diagrams, ductwork drawings and/or wiring diagrams. Where substituted equipment furnished requires use of larger, more, or differently arranged connections, such connections shall be installed to the complete satisfaction of Engineer without additional cost to Owner.

G. The Contractor is responsible for full coordination of all changes required by substituted equipment, including dimensional clearance.

H. The Contractor is responsible for all additional costs of equipment installation, coordination and engineering which results from his substitution. This includes all aspects of the work including architectural, structural, civil, electrical, and mechanical. This also includes costs for the redesign time of Architects and Engineers.

I. Costs associated with dimensional, performance, or other deviations from the “basis of design” equipment, including engineering costs to evaluate such deviations, shall be paid by the Contractor. If a product other than the “basis of design” product is submitted and subsequently rejected during the submittal process, Contractor shall provide the “basis of design” product.

J. Should a substitution be accepted and subsequently proven unsatisfactory for the service intended within the warranty period, the Contractor shall provide the basis of design, or make corrections as directed by Engineer.

1.07. GUARANTY-WARRANTY

A. Guarantee shall include capacity and integrated performance of component parts of various systems in strict accord with the intent and purpose of these specifications. Conduct such tests as herein specified or as may be required by the Engineer to demonstrate capacity and performance ability of various systems to maintain specified conditions.

B. Compile and assemble the warranties specified in the mechanical division, tabulated and indexed for easy reference.

C. Provide complete warranty information for each item to include product or equipment; date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, telephone numbers, and procedures for filing a claim and obtaining warranty services.

D. All materials and equipment shall carry a full year's warranty from time Owner accepts building or the date of substantial completion, whichever is earlier, regardless of start-up date of equipment, unless a longer warranty period is specified under other sections. Longer warranty periods for specific items shall be listed in other sections of these specifications.

PART 2 MATERIAL

2.01. MATERIAL AND EQUIPMENT

A. Equipment shall be new, undamaged, and of the same manufacturer except where indicated otherwise.

B. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

C. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.

D. Protect work and equipment at all times from damage, weather, and entrance of dirt and water. Close pipe and duct openings with caps or plugs during installation.

2.02. ELECTRICAL

A. Contractor shall carefully coordinate voltage and amperage requirements of equipment to be provided. Coordinate with Electrical Contractor prior to equipment order. Any change to electrical systems required by Contractor's substitutions or uncoordinated equipment needs shall be made without cost to the project.

B. Provide all electrical interlock, control, and other wiring, not covered specifically under the electrical drawings and specifications, for proper operation and control of all equipment specified under this Division of the specifications.

C. Supervise and coordinate all electrical work in connection with mechanical systems.

D. Furnish all motor controllers and contactors, not furnished as part of a motor control center, or by Electrical Division for proper operation of all motors. Submit motor data with submittals.

2.03. ROOF AND FLASHINGS

A. A. Special care shall be taken on roofs to prevent damage. Promptly repair any damage at no additional expense to the Owner. Comply with bonding requirements of new and existing roofs.

B. B. Flashings are not covered by this section. Refer to Architectural Division.

2.04. ACCESS PANELS

A. Provide access panels in all floors, walls, and plaster and non-lay-in type ceilings as required or as indicated to service devices in piping requiring access, controls, devices in ductwork requiring access, and other system components requiring access for service or regular maintenance. Closely coordinate requirements for access doors before bidding.

B. Access doors shall be "Milcor" type appropriate for the construction involved.

C. Size and type shall be as required for proper service and/or as may be directed by the

Engineer. Minimum size to be 24” x 24”.

2.05. ASBESTOS AND OTHER HAZARDOUS OR TOXIC MATERIALS

A. No Asbestos containing materials shall be used on this project.

B. Contractor is responsible for his own means and methods of safety where Hazardous or Toxic materials are use for the installation of his work. All work shall comply with state and federal regulations.

C. Contractor shall protect the Owner's facility and employees from conditions generated by his work.

D. In the event that a potentially hazardous material is discovered during the course of the work, Contractor shall stop work immediately, and provide for the safety of his employees and other occupants. He shall make proper notifications as required by his contract and by law.

2.06. CONCRETE

A. Concrete materials and installations indicated on the drawings for curbs, pads, and supports for mechanical equipment shall be provided as part of the contract.

B. Comply with other architectural and structural portions of the specifications for materials and methods.

C. Concrete.

1. Concrete shall be commercial grade containing Portland cement, aggregates, clean water, and mix ratios suitable for the loads, and site conditions.

2. Concrete shall be 3,000 psi class indoors and 3,500 psi class outdoors unless noted otherwise.

3. Comply with ACI standards for cold and hot weather applications.

D. Installation

1. Use rigid and smooth forms to prevent visible defects and deflections in the work. Use form compound to prevent concrete bonding to the forms.

2. Provide chamfered corners on the tops of curbs.

3. Reinforce pads and curbs with steel reinforcing bars minimum size number 3, welded wire fabric, or as indicated on the drawings. Set the reinforcing depth within the concrete for optimum strength for the application.

4. Provide equipment pads of sizes indicated and at least large enough to extend past the mechanical equipment 6" on all sides. Minimum height 6” unless otherwise noted.

5. Pour pads integral with the floor slab, isolate from the floor slab, or dowel the

pads, as indicated on the drawings.

6. Grout all voids with high strength grout mixture.

7. Installation of the pads shall be coordinated so that the concrete has set and the strength is suitable for installation of the equipment.

8. Set anchor bolts where indicated by either equipment manufacturer or Structural Engineer.

9. Brush-finish equipment pads.

2.07. LOCAL SITE CONDITIONS

A. Before bidding, make complete investigation at site in order to be informed as to location of utilities and as to conditions under which work is to be performed. Utility locations shown were obtained from surveys and/or local utility companies and are offered as a general guide only and are not to be assured accurate.

B. Make determination of soil conditions before bidding. These specifications and accompanying drawings in no way imply condition of soil to be encountered.

2.08. EXCAVATION, TRENCHING AND BACKFILLING

A. Excavation, trenching, and backfilling in connection with the mechanical system, to a point 5'-0" outside the building, is included as part of this Division, unless indicated otherwise.

B. Excavation required shall be done as part of the contract price regardless of any implied conditions on the drawings or in these specifications.

C. Excavation to have 12" minimum and 24" maximum clearance on all sides. Do not carry excavation below required level unless indicated otherwise on the drawings. Excess excavation below required level shall be backfilled at no expense to Owner with earth, sand, gravel, or concrete, as directed by Engineer and thoroughly compacted. Remove any unstable soil and replace with gravel, crushed stone, or clean sand and thoroughly compact. Engineer will determine the depth of removal of any unstable soil encountered. Grade ground adjacent to excavation to prevent water from running into excavation. Remove accumulated water in the excavation.

D. Banks of trenches shall be vertical or as shown on the drawings. Width of trench shall be 5" minimum, 8" maximum on each side of pipe bell. Excavate bell holes accurately to size by hand. In rock, excavations shall be carried 8" below bottom of pipe. Use loose earth or gravel for backfill and tamp thoroughly.

E. Bracing, sheathing, and shoring shall be performed as necessary to complete and protect excavations indicated on the drawings, as required for safety, as directed by Engineer, and to conform to governing laws and state and federal regulations. Comply with OSHA Regulations.

F. After piping installation, inspection, testing, and approval by governing agency; backfill trenches with clean, stable soil free from stones. Place backfill in 4" layers, tamped under and around pipe and conduit to height of at least 2' above pipe. Tamping shall be done

in such manner as not to disturb underlying work. Remainder of trenches and excavations shall be backfilled with clean, stable earth, deposited in 8" layers and brought up to rough grade, with each layer compacted to density of surrounding soil. Remove sheathing and shoring as backfill is placed and fill space with dry sand. Compaction tests may be required by the Engineer, with the costs paid by the Contractor.

G. Underground piping shall be marked with metallic marking tape inserted in the trench a minimum of 12" below grade and a minimum of 12" above mains.

H. Replace existing appurtenances removed or damaged in connection with work, and restore to original conditions, unless directed otherwise.

2.09. MECHANICAL INSTALLATIONS:

A. Coordinate mechanical equipment and material installation with other building components and other trades. Investigate each space in the structure through which mechanical equipment furnished under these specifications must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. Verify all dimensions by field measurements. By ordering equipment, Contractor assumes responsibility for the installation and orientation of equipment in the available space.

C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

F. Fit equipment, pipe, and duct into the available spaces in the building and introduce into the building, at a time, and in a manner, as not to damage the structure. Install ductwork and piping to provide the maximum possible clear height underneath.

G. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

H. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

I. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.

J. Coordinate the installation of mechanical materials and equipment above ceilings with suspension systems, light fixtures, and other installations.

K. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised

service companies, and controlling agencies. Provide required connection for each service.

L. Do not support material or equipment of other trades from piping or ductwork.

M. Do not use equipment, piping, or ductwork as scaffolding, scaffolding support, or as other means to access the work. Damaged systems and components shall be repaired or replaced in accordance with the full satisfaction of the Owner and Engineer.

N. Core drill piping penetrations of concrete walls, floors, and other concrete structures.

O. Equipment locations shown on the drawings are approximate. Final locations shall be established and determined in the field to best utilize available space.

P. Replace architectural features removed or damaged during the course of the work.

Q. Maintain fire assembly ratings as dictated by authorities having jurisdiction. Seal around penetrations through UL rated assemblies, fire, and smoke walls.

R. Fully seal around duct or pipe routed through exterior walls.

2.10. EQUIPMENT CONNECTIONS

A. Each equipment item with drain connections shall be provided with a properly-sized drain run to the nearest floor drain or as directed.

B. Rough-in and make final required connections to equipment, furnished under other Divisions of the Specifications or by the Owner.

1. Provide necessary labor and materials for a complete installation. Trap and vent drainage connections as required.

2. If equipment or fixtures furnished by others are not delivered prior to final acceptance, services shall be capped or plugged at walls or floor as directed, ready for future connection.

C. No equipment or fixture shall be "roughed-in" until proper rough-in drawings are provided to the installer.

D. Extend grease fittings to accessible locations.

2.11. CUTTING AND PATCHING

A. Provide cutting and patching required to perform the mechanical work, when alteration, repair, renovation, or addition, to existing construction is specified or required for new work.

B. Cutting of structural members will not be permitted except through explicit instructions from the Engineer. Reinforcing will be required where members are cut.

C. Do not endanger or damage installed work through procedures and processes of cutting and patching.

D. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.

E. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.

F. Perform cutting, fitting, and patching required to:

1. Uncover Work to provide for installation of ill-timed Work.

2. Remove and replace defective Work.

3. Remove and replace Work not confirming to requirements of the Contract Documents.

4. Remove samples of installed Work as specified for testing.

5. Upon written instructions from Engineer, uncover and restore Work to provide for Engineer observation of concealed Work.

2.12. GROUTING

A. Mix and install grout for mechanical equipment base bearing surfaces, base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

I. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5,000-psi (34.5-MPa), 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

2.13. SEISMIC

A. Mechanical systems shall be installed in conformance with the requirements of the state and federal codes and regulations for Seismic considerations, as specified and noted on the drawings.

B. All seismic restraining and snubbing devices shall be manufactured specifically for this duty. Devices constructed by the Contractor will not be accepted.

C. Contractor shall be responsible for the design and installation of the restraining and snubbing systems based on the criteria included on the drawings and in the specifications, and the actual equipment, and locations of installation.

2.14. START UP, TESTING, AND ADJUSTING

A. Contractor shall include adequate time in construction schedule for HVAC system start-up; testing, adjusting, and balancing; and control system installation, programming, testing, and commissioning.

B. Each and every phase of the plumbing, air conditioning, heating and ventilating systems shall be operated separately, or in conjunction, one with the other, for a sufficient period of time to demonstrate to the entire satisfaction of the Engineer the ability of the systems to meet the capacity and the performance requirements while maintaining design conditions, in accordance with the intent of these specifications.

C. Previous to any performance tests, the Contractor shall have set and adjusted valves, dampers, motors, controllers, thermostats, and other items as are necessary to properly balance phases of the mechanical systems and shall have the systems operating and maintaining design temperatures, humidity, and air circulation throughout all areas of the building.

D. See other sections of these specifications for other possible records and tests to be made.

E. During the first-year warranty, the Contractor may be required to make some or all of the readings above to assure system is functioning properly through the various seasons. Contractor shall make additional adjustments as required.

2.15. PAINTING

A. Provide mechanical equipment with factory painted finish. Where factory finish is damaged during handling and installation, use touch-up paint of same type and color as original paint. Where extensive refinishing of factory applied finishes are required, equipment shall be repainted by the factory.

B. All uninsulated, ferrous equipment, tanks, pipes, fittings, pipe hangers, supports, miscellaneous steel, and ironwork without factory finish shall be primed and painted. Do not paint galvanized hanger rods or galvanized duct straps.

1. Where exposed to view, except in mechanical spaces, color shall be as selected by the Architect.

2. Where located in mechanical spaces or in areas not exposed to view, color shall be as directed by Owner’s representative to match Owner’s existing color schedule. In the absence of an Owner’s color schedule, color shall be black.

C. All insulated mechanical equipment, tanks, and piping not provided with a factory finish shall be painted.

1. Where exposed to view, except in mechanical spaces, color shall be as selected by the Architect.

2. Where located in mechanical spaces or in areas not exposed to view, color shall be as directed by Owner's representative to match Owner's existing color schedule. In the absence of an Owner's color schedule, color shall be black.

D. For uninsulated material to be painted, prime with one coat of alkyd primer and paint with two coats of alkyd enamel gloss. Paint shall be suitable for the environmental and temperature conditions where material is installed.

E. Paint insulated material with two coats of alkyd enamel gloss. Paint shall be suitable for the environmental and temperature conditions where material is installed.

F. Prepare surfaces for painting in accordance with the paint manufacturer's requirements. Remove or protect portions of the work which are not to be painted.

G. Apply primer coat(s) of paint as recommended by the paint manufacturer.

H. Apply final coat(s) of paint as recommended by the paint manufacturer. Apply paint by brush or roller as dictated by the surface to be painted. Paint should have a smooth appearance without cloudiness, spotting, marks, runs, or other surface imperfections.

I. Clean-up the area of materials, waste, and rubbish. Clean splattered surfaces.

J. Protect the work from damage. Touch-up and restore defaced painted surfaces at the end of the project.

2.16. NOISE: Contractor shall isolate pipes, ductwork, equipment, and other items to insure no additional noise is generated or transmitted to the building when systems are in operation.

2.17. ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment and elevation to support and anchor mechanical materials and equipment. See Paragraph 3.11 for painting.

B. Field Welding: Comply with AWS D1.1.

2.18. OPERATION INSTRUCTIONS

A. Contractor shall provide bound manuals containing complete repair parts' lists, and operating service and maintenance instructions for equipment provided. The manual shall include:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.

2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and

emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing and instructions and lubrication charts and schedules.

B. Contractor shall carefully instruct the Owner's operations personnel during the adjustment and testing period of the equipment for such length of time as may be necessary to thoroughly familiarize them with the proper care, operation, and maintenance of the equipment.

C. Contractor shall turn special tools, maintenance items, keys, other devices and materials required to operate or maintain the systems over to the Owner.

2.19. CLEAN UP

A. Do not allow waste material or rubbish to accumulate in or about jobsite. Clean work areas daily.

B. At completion of work, remove rubbish, tools, scaffolding, and surplus materials from and about building, leaving work clean and ready for use without further cleaning required. Clean equipment, piping, valves, fixtures, and fittings of grease, metal cuttings, insulation cement, dust, dirt, paper labels, and other materials that are not part of the final finish.

C. Any discoloration or other damage to parts of building, its finish or furnishings due to failure to properly clean or keep mechanical systems clean shall be repaired without cost to Owner.

2.20. NAMEPLATE DATA:

A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

B. Locate nameplates in an accessible location. Where manufacturer’s name plate is not stamped or engraved, provide additional heavy gauge aluminum or brass, stamped or engraved nameplate.

C. Do not remove manufacturer’s nameplates. When manufacturer’s nameplates are to be covered by insulation or other material, provide a separate nameplate for mounting on the exterior of the covering.

2.21. RECORD DOCUMENTS

A. At completion of this project, the Contractor shall provide Engineer with one set of "red lined" design drawings and specification showing all Work installed by him.

B. These documents shall incorporate all changes made in the course of the project so as to enable the Owner to properly maintain, operate, and repair both exposed and concealed work. The redlines shall indicate changes:

1. Made by Contractor.

2. Addendum Items.

3. Change Orders.

4. Substitutions.

C. Drawings and specifications shall be updated during the progress of the work and kept at the job site.

D. Record Prints: Maintain one set of blue-line or black-line prints of the Contract Drawings, Submittals, and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.

b. Accurately record information in an understandable drawing technique.

c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2.22. FINAL PROJECT OBSERVATION: The final project observation shall not be made until the following items have been assembled and approved as indicated in other sections of the specifications.

A. Certificate of acceptance from local inspecting authorities.

B. Letter of compliance from the Controls Systems Provider indicating that the system is complete, fully operational, and installed as specified by manufacturer's certified or licensed individuals.

C. Test and Balance report.

D. Owner's Operations and Maintenance manual.

E. Copies of bonds, insurance certificates, waivers, affidavits, warranties and guarantees, and other documents required in the specifications signed and ready for appropriate action.

F. Written notification from the Contractor that the work is complete and ready for final observation and the above documents are completed and available

G. Other documentation which may be required by the Engineer.

2.23. PROJECT CLOSEOUT

A. The final mechanical systems closeout shall not be completed until the Contractor has completed his work and submitted the documents required by Division 1 portions of the

specifications. In addition the following work items and specific mechanical documents described in other portions of this specification section shall also be submitted and approved:

1. Record drawings.

2. Record specifications.

3. Guarantee and Warranties.

4. Operating and Maintenance Manuals (O&M). O&M Manuals shall also be provided to the Owner in duplicate. Manuals shall contain approved shop drawings, operations and maintenance instructions, parts manuals for HVAC equipment, an accurate set of design plans showing all construction revisions to the design set, and a copy of the test and balance report.

5. Final clean up.

6. Final Test and Balance Reports with startup logs.

7. Pipe and Equipment Identification.

8. Pipe test certifications.

9. Water treatment analysis and application.

10. Bonds, Insurance Certificates, Waivers, Affidavits, and other documents required in the specifications signed and ready for appropriate action.

11. Other items which may be required by the Engineer.

B. Confirm in writing that specified training specified has been completed with the Owner.

C. Confirm in writing that specified demonstrations have been completed with the Owner.

D. Confirm that test and balance is complete.

END OF SECTION

SECTION 23 0015

FIRESTOPPING AND SMOKE STOPPING

PART 1 - GENERAL

1.01. SUMMARY

A. Section includes:

1. Through-penetration firestopping in fire rated construction.

B. Scope:

1. The scope of the work shall include the mechanical systems, HVAC piping and ductwork, plumbing piping, fire protection piping, and other systems installed by the contractor.

1.02. 1.02 REFERENCES

A. Underwriters Laboratories

1. U.L. Fire Resistant Directory

a. Through-penetration firestop devices (XHCR)

b. Fire resistance ratings (BXUV)

c. Through-penetration firestop systems (XHEZ)

d. Fill, void, or cavity material (XHHW)

B. American Society for Testing and Materials Standards:

1. ASTM E 814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.

1.03. 1.03 DEFINITIONS

A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.

B. Barriers: Time rated fire walls, time rated ceiling/floor assemblies, and structural floors.

C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.

D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.

E. System: Specific products and applications, classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations.

F. Sleeve: Metal fabrication or pipe section extending through thickness off barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections and may or may not be required.

1.04. SYSTEM DESCRIPTION

A. Design Requirements

1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

1.05. SUBMITTALS

A. Submit in accordance with general conditions unless otherwise indicated.

B. Product data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication

2. Manufacturer's installation instructions.

C. Shop drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, plus the following specific requirements.

1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.

2. Manufacturer or manufacturers’ representative shall provide qualified engineering judgements and drawings relating to non-standard applications as needed.

D. Quality control submittals:

1. Statement of qualifications.

E. Applicators' qualifications statement:

1. List past projects indicating required experience.

1.06. QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

1.07. REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of combustibility.

1.08. ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below

60 degrees F.

B. Maintain this minimum temperature before, during, and for 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

D. Furnish forced air ventilation during installation if required by manufacturer.

E. Keep flammable materials away from sparks or flame.

F. Provide masking and drop cloths to prevent contamination of adjacent surfaces by firestopping materials.

G. Comply with manufacturing recommendations for temperature and humidity conditions before, during and after installation of firestopping.

1.09. SEQUENCING

A. Sequence work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

1.10. QUALITY ASSURANCE

A. Installer's qualifications: Firm experienced in installation or application of systems similar in complexity to those required for this project, plus the following:

1. Acceptable to or licensed by manufacturer, State or local authority where applicable.

2. At least 2 years experience with systems.

3. Successfully completed at least 5 comparable scale projects using this system.

B. Local and State regulatory requirements: Submit forms or acceptance for proposed assemblies not conforming to specific UL Firestop System numbers, or UL classified devices.

C. Materials shall have been tested to provide fire rating at least equal to that of the construction.

1.11. DELIVERY, STORAGE, AND HANDLING

A. Packing and shipping:

1. Deliver products in original unopened packaging with legible manufacturer's identification.

2. Coordinate delivery with scheduled installation date, allow minimum storage at site.

B. Storage and protection: Store materials in a clean, dry, ventilated location. Protect from soiling, abuse, moisture and freezing when required. Follow manufacturer's instruction.

1.12. PROJECT CONDITIONS

A. Existing conditions:

1. Verify existing conditions and substrates before starting work. Correct

unsatisfactory conditions before proceeding.

2. Proceed with installation only after penetrations of the substrate and supporting brackets have been installed.

1.13. GUARANTEE

A. Submit copies of written guarantee agreeing to repair or replace joint sealers which fail in joint adhesion, co-adhesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The guarantee period shall be one year from date of substantial completion.

PART 2 PRODUCTS

2.01. THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the U.L. Fire Resistance Director under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

1. Additional requirements: Withstand the passage of cold smoke either as an inherent property of the system, or by the use of a separate product included as a part of the U.L. system or device, and designed to perform this function.

2. Acceptable manufacturers and products: Those listed in the U.L. Fire Resistance directory for the U.L. System involved and as further defined in Part 3.06 of this section.

3. All firestopping products must be from a single manufacturer. All trades shall use products from the same manufacturer.

4. Products shall be 3M firestopping products and systems or equal.

2.02. SMOKE-STOPPING AT SMOKE PARTITIONS

A. Through-Penetration Smoke-Stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

B. Construction-Gap Smoke-Stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, as specified in this section, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

2.03. MATERIALS

A. Firestopping Material: Single or multiple component silicone elastomeric rubber type foam compound mixed with incombustible non-asbestos ceramic fibers.

B. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

2.04. 2.04 ACCESSORIE

A. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

B. Forming materials: As classified under Category XHKU in the U.L. Fire Resistance Directory.

PART 3 EXECUTION

3.01. EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.

2. Do not proceed until unsatisfactory conditions have been corrected.

3.02. SURFACE PREPARATION

A. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust, or other substances that may affect proper fitting, adhesion, or the required fire resistance.

3.03. INSTALLATION

A. Apply primer and materials in accordance with manufacturer's instructions.

B. Install penetration seal materials in accordance with printed instruction of the U.L. Fire Resistance Directory and in accordance with manufacturer's instruction.

C. Seal holes or voids made by penetrations to ensure an effective smoke barrier.

D. Where floor openings without penetrating items are more than four inches in width and subject to traffic or loading, install firestopping materials capable of supporting same loading as floor.

E. Apply firestopping material in sufficient thickness to achieve rating and to a uniform density and texture.

F. Protect materials from damage on surfaces subject to traffic.

G. Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.

H. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges - installed in accordance with fire damper manufacturer's recommendations.

I. Where large openings are created in walls or floors to permit installation of pipes, ducts, cable tray, bus duct or other items, close unused portions of opening with firestopping material tested for the application. See U.L. Fire Resistance Directory.

J. Install smoke stopping as specified for firestopping.

K. Where rated walls are constructed with horizontally continuous air space, double width masonry, or double stud frame construction, provide vertical 12 inch wide fiber dams for full thickness and height of air cavity at maximum 15 foot intervals.

L. Dam material to remain.

3.04. FIELD QUALITY CONTROL

A. Examine penetration sealed areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Perform under this section patching and repairing of firestopping caused by cutting or penetration by other trades.

3.05. ADJUSTING AND CLEANING

A. Clean adjacent surfaces of firestopping materials.

B. Clean up spills of liquid components.

C. Neatly cut and trim materials as required.

D. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

3.06. PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

3.07. SYSTEMS AND APPLICATION

A. The installation shall be as required by manufacturer for type of construction, Type of U.L. systems, type of penetration, and type of fire stopping system.

END OF SECTION

SECTION 23 00 30
ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This section specifies the basic requirements for electrical components which are to be provided for operation of mechanical equipment. These components include, but are not limited to, motors, starters, and disconnect switches when indicated, furnished as an integral part of packaged mechanical equipment, or furnished separately for mechanical equipment.

B. Furnish all motor controllers and contactors, not furnished as part of a motor control center, for proper operation of all motors.

C. Specific electrical requirements (i.e., horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specification sections and scheduled on the drawings.

1.02 REFERENCES:

A. NEMA Standards MG 1: Motors and Generators.

B. NEMA Standard ICS 2: Industrial Control Devices, Controllers, and Assemblies.

C. NEMA Standard 250: Enclosures for Electrical Equipment.

D. NEMA Standard KS 1: Enclosed Switches.

E. National Electric Code (NFPA 70).

1.03 SUBMITTALS:

A. Separate submittal is not required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves, as required by the individual equipment specification sections.

1.04 QUALITY ASSURANCE:

A. Electrical components and materials shall be UL labeled.

B. The electrical work shall comply with the National Electric Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Equipment shall be by same manufacturer, except those items furnished by an equipment manufacturer as an integral part of his equipment. Where possible the equipment shall be by the same manufacturer specified in Division 16.

2.02 MOTORS: The following are basic requirements for simple or common motors. For special

motors, more detailed and specific requirements are specified in the individual equipment specifications.

A. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

B. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.

C. 2-speed motors shall have 2 separate windings on poly-phase motors.

D. Temperature Rating: Rated for 40 degrees C. environment with maximum 90 degree C rise for continuous duty at full load (Class B insulation).

E. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly spaced starts per hour for manually controlled motors.

F. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

G. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

1. Frames: NEMA Standard No. 48 or 56; use driven equipment manufacturer's standards to suit specific application.

2. Bearings:

a. Ball or roller bearings with inner and outer shaft seals.

b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.

c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.

3. Enclosure Type:

a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.

b. Guarded drip-proof motors where exposed to contact by employees or building occupants.

c. Weather protected Type I for outdoor use, Type II where not housed.

4. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

5. Noise Rating: "Quiet".

6. Efficiency:

a. Motor shall comply with the efficiency requirements of the Energy

Independence and Security Act of 2007.

b. Motors smaller than 1 HP shall have minimum full load efficiencies levels per NEMA Standards.

c. Motors 1 HP and larger shall be premium efficiency.

7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

2.03 STARTERS, ELECTRICAL DEVICES, AND WIRING:

A. Motor Starter Characteristics:

1. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R or NEMA 12 with conduit hubs installed by contractor, or units in hazardous locations which shall have NEC proper class and division.

2. Type and size of starter shall conform to adopted standards and recommended practices of the National Electric Code and Underwriters' Laboratories.

B. Manual Switches: Manual switches shall have:

1. Pilot lights and extra positions for multi-speed motors.

2. Overload protection: Melting alloy type thermal overload relays.

3. Manual starters / switches are to be used on fractional horsepower motors only.

C. Magnetic Starters:

1. Momentary contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.

2. Trip-free thermal overload relays, each phase.

3. Interlocks, witches and similar devices as required for coordination with control requirements of controls sections.

4. Built-in 120 volt control circuit transformer, with 2 primary and one secondary fuse, where service exceeds 240 volts. Fuses sized to carry holding coil circuit and other connected devices.

5. Externally operated manual reset.

6. Under-voltage release or protection (3-wire control).

7. Branch circuit protection shall meet type 2 coordination protection.

8. A hand-off-auto selector switch shall be provided in addition to start-stop buttons for all devices being controlled automatically.

9. Phase loss relay.

a. Provide protective relays with DPDT 600V rated contacts, locking potentiometer undervoltage adjustment, and LED indicating light at each starter for motors greater than 5 HP. Equal to Square D Class 8430, Type MPD, mounted in suitable enclosure.

D. Motor Connections:

1. Flexible conduit, except where plug-in electrical cords are specifically indicated.

E. Heater Contactors:

1. Contactors for resistance heat shall be by same manufacturer as starters unless furnished with heaters. Contactors shall be of the magnetic type and mounted in NEMA Type 1 general purpose enclosure. Contactors shall carry a UL listing and shall be rated for 100,000 cycles.

F. Disconnect Switches:

1. Fusible Switches: Fused, each phase; heavy duty; horsepower rated; non-teasible, quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "open" position; arc quenchers; capacity and characteristics as indicated.

2. Non-fusible Switches: For equipment less than 1 horsepower, switches shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment 1 horsepower and larger, switches shall be the same as fusible type.

2.04 CAPACITORS:

A. Features:

1. Individual unit cells, all welded steel housing, each capacitor internally fused, non-flammable synthetic liquid impregnant, craft tissue insulation, and aluminum foil electrodes.

2. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower and larger that have an uncorrected power factor of less than 85 percent at rated load.

PART 3 - EXECUTION

3.01 GENERAL

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 hp and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Deliver starters and wiring devices which have not been factory-installed on equipment

unit to electrical installer for installation.

C. Install starters and wiring devices at locations indicated, securely supported and anchored, and in accordance with manufacturer's installation instructions. Locate for proper operation access, including visibility, and for safety. Do not cover equipment data or informational tags when device is to be mounted on equipment.

D. Install control connections for motors to comply with NEC and applicable provisions of Electrical. Install equipment grounding except where non-grounded isolation of motor is indicated.

E. Connect protective relays to line side lugs of the motor starter and wire control contacts into motor starter circuit.

F. Label starters with engraved plastic nameplate describing the equipment served, e.g., "A.C. Unit No. 1". Nameplates shall be U.V. stabilized for use indoor / outdoor. Attach nameplates with clear silicone sealant.

END OF SECTION

SECTION 23 0075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.01. SUMMARY

A. This Section includes the following mechanical identification applications:

1. Equipment identification.
2. Pipe identification.
3. Valve tags.
4. Valve schedule.
5. Duct identification.

1.02. SUBMITTALS

A. Product Data: For each type of product proposed.

B. Product Schedule: Provide schedule indicating each type of identification material to be used for equipment, piping, and ductwork. Indicate colors to be used.

C. Valve Schedule: Submit a valve schedule for each piping system, typewritten and reproduced on 8-1/2” x 11” bond paper. Provide three (3) copies. Mark valves which are intended for emergency shut-off, normally open, normally closed, and similar special uses by special flag in the margin of the schedule. Include the following for each valve:

1. Valve identification number.
2. System.
3. Purpose.
4. Location.
5. Type.
6. Size.
7. Manufacturer.

1.03. QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME A13.1, “Scheme for the Identification of Piping Systems”, for letter size, length of color field, for colors not included in the schedule herein, and for viewing angles of identification devices for piping.

1.04. COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with location of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.01. EQUIPMENT IDENTIFICATION

A. Engraved Plastic Laminate Identification Signs

1. General: Provide engraving stock melamine plastic laminate in the sizes and thicknesses indicated, with engraver’s standard letter style, black with white core (letter color) except as otherwise indicated, punched for mechanical fastening except where using adhesive mounting.

2. Thickness: 1/16” for units up to 20 inches square or 8” length; 1/8” for larger units.

3. Fasteners: Self tapping stainless steel screws except use contact-type, permanent adhesive where screws cannot or should not penetrate the substrate. Where sign cannot be attached directly to device or equipment, attach with brass chain.

4. Letter sizes: Minimum ¼ inch for names of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionally larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of the principal lettering.

2.02. PIPE IDENTIFICATION

A. All above grade piping shall be identified with pipe markers with colors as indicated. Identification shall have proper legend and meet OSHA specifications. Comply with ASME A13.1, unless otherwise noted.

B. For piping where diameter including insulation is less than 8”, pipe markers shall be plastic, pre-tensioned, semi-rigid type that encircles entire pipe without the use of adhesives. Tape and sticker types are unacceptable.

C. For piping where diameter including insulation is 8” or greater, pipe markers shall be plastic, full-band, semi-rigid type strapped to pipe using manufacturer’s standard stainless steel bands.

D. Underground line markers: Manufacturer's standard permanent, bright colored, continuous printed, plastic tape intended for direct burial service, not less than 6" wide and 4 mils thick. Provide tape with printing which most accurately indicates the type of buried pipe.

E. Manufacturer: Pipe markers as manufactured by Seton, Brady, Brimar, or EMED are acceptable.

F. Identification Schedule:

Piping System	Legend	Band/Text Color
1. Plumbing Piping System		
Cold Water	Cold Water	Green/White
Hot Water	Hot Water	Yellow/Black
Hot Water Return	Hot Water Return	Yellow/Black
2. Gas Piping System		
Low Pressure Natural Gas	Low Pressure Gas	Yellow/Black
High Pressure Natural Gas	High Pressure Gas	Yellow/Black
Gas Vent	Gas Vent	Yellow/Black
3. Sanitary Sewer System		
Sanitary Waste	Sanitary Sewer	Green/White
Sanitary Vent	Sanitary Vent	Green/White
4. Storm Drain System		
Storm Drain	Storm Drain	Green/White

G. Arrows and lettering shall be black. Arrows shall point in the direction of flow. Locate downstream of pipe legend.

H. Arrows shall be of same color as bands and shall point in direction of flow. Locate downstream of pipe legend.

I. Valve Identification: Provide brass tags for all valves and steam traps with legend

describing function of each valve and trap. Tag shall also indicate normally open or normally closed, where position is noted on the drawings.

J. Valve Tags: Brass tags shall be a minimum of 2" diameter or 3-1/2" oval, to accommodate 1" high numbers. Tag shall be equipped with a 3/16" X 6" long brass chain.

2.03. DUCT IDENTIFICATION

A. Engraved Plastic Laminate Identification Signs

1. General: Provide engraving stock melamine plastic laminate in the sizes and thicknesses indicated, with engraver's standard letter style, colored black background with white letters except as otherwise indicated.

2. Thickness: 1/16" for units up to 20 inches square or 8" length; 1/8" for larger units.

3. Fasteners: Contact-type, permanent adhesive.

4. Letter sizes: Minimum ¼ inch for names of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionally larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of the principal lettering.

B. Stencils: As specified and indicated herein.

2.04. STENCILS: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4" for ducts; and minimum letter height of ¾" for equipment and access door signs. Use alkyd paint. Use stencils only as directed herein.

PART 3 EXECUTION

3.01. EQUIPMENT IDENTIFICATION

A. Provide permanent, factory, operational data, nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data. Locate nameplates in an accessible location. Where manufacturer's nameplate is not stamped or engraved, provide additional heavy gauge, aluminum or brass, stamped or engraved nameplate. Do not remove manufacturer's nameplates. When manufacturer's nameplates are to be covered by insulation or other material, provide a separate nameplate for mounting on the exterior of the covering.

B. In addition to factory nameplate, provide an engraved plastic laminate (stenciled) identification sign for each major item of mechanical equipment and each operational

device. Provide identification signs for the following general categories of equipment.

1. Main control and operating valves, including safety devices and hazardous units such as gas outlets or steam relief valves.

2. Chillers, cooling towers, condensing units, compressors, pumps, and similar motor-driven units.

3. Heat exchangers, coils, and similar equipment.

4. Fans and blowers.

5. Packaged and central-station type air units.

6. Tanks and pressure vessels.

7. Strainers, filters, humidifiers, water treatment systems, and similar equipment.

8. Control panels.

9. Fuel burning units, such as boilers, furnaces, and heaters.

10. Fire department hose valves and hose stations.

C. Provide engraved sign at each access door, indicating equipment or device to be accessed.

D. Coordinate names, abbreviations, and other designations used in equipment identification with corresponding designations shown, specified, scheduled, or as designated by the Owner's representative. Provide numbers, lettering, and wording as indicated or as directed by the Owner's representative. Owner shall set priority for lettering and graphics. Where multiple systems of the same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples; Boiler No. 3, AHU-1H, Standpipe G14).

3.02. PIPE IDENTIFICATION

A. Provide 1" thick molded fiberglass insulation with jacket under each plastic pipe marker to be installed on uninsulated pipes where fluid temperatures will be 125°F or greater. Insulation shall extend 4" beyond edges of marker.

B. Valve tags and steam traps shall be numbered as indicated on the valve listing provided to the Owner.

C. See Section 15050 for piping to be painted.

D. As a minimum, identification shall be applied to piping at the following locations:

1. Adjacent to each valve.

2. At each branch and riser take-off.

3. At each pipe passage through wall, floor, and ceiling construction.

4. At each pipe passage to underground.

5. At not more than forty feet spacing on straight pipe runs.

E. Place identification so it can be easily read. Arrows shall be applied to indicate direction of flow.

F. Underground Piping: During back-filling of each exterior underground piping system, install plastic line marker, located directly over buried line no deeper than 8” below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16”, install a single line marker.

3.03. DUCTWORK IDENTIFICATION

A. Identify ductwork using stenciled signs. Letter color for stenciled signs shall be either white or black. Provide the color that produces the most contrast with the covering being stenciled. Indicate direction of flow, air handling unit or fan, air terminal box, and duct service (such as supply, return, and exhaust).

B. Apply ductwork identification at the following locations:

1. Adjacent to each damper.

2. At each passage through walls, floors, or ceiling construction.

3. At no more than forty feet intervals.

4. At air handling units, fans, and air terminal boxes

END OF SECTION 23 0075

SECTION 23 0086

PIPING INSULATION

PART 1 - GENERAL

1.01. SUMMARY

A. Perform all Work required to provide and install piping insulation, jackets, and accessories indicated by the Contract Documents with supplementary items necessary for proper installation.

B. Insulation of Underground Piping is specified elsewhere and not work of this Section.

1.02. REFERENCE STANDARDS

C. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

D. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.

E. All materials, installation and Workmanship shall comply with the applicable requirements and standards addressed within the following references:

1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.

2. ASTM C168 - Terminology Relating to Thermal Insulation Materials.

3. ASTM C177 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded- Hot-Plate Apparatus.

4. ASTM C195 - Mineral Fiber Thermal Insulating Cement.

5. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.

6. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

7. ASTM C518 - Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

8. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.

9. ASTM C547 - Mineral Fiber Pipe Insulation.

10. ASTM C552 - Cellular Glass Thermal Insulation.

11. ASTM C578 - Rigid, Cellular Polystyrene Thermal Insulation.

12. ASTM C585 - Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).

13. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.

14. ASTM C450 - Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.

15. ASTM C610 - Molded Expanded Perlite Block and Pipe Thermal Insulation.

16. ASTM C921 - Jackets for Thermal Insulation.

17. ASTM C1126 - Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.

18. ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

19. ASTM D1667 - Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed- Cell).

20. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.

21. ASTM C795 - Insulation For Use Over Austenitic Steel.

22. ASTM E84 - Surface Burning Characteristics of Building Materials.

23. ASTM E96 - Water Vapor Transmission of Materials.

24. NFPA 255 - Surface Burning Characteristics of Building Materials.

25. UL 723 - Surface Burning Characteristics of Building Materials.

26. ASTM D5590 - Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay

1.03. DEFINITIONS

F. Concealed: Areas that cannot be seen by the building occupants.

G. Interior Exposed: Areas that are exposed to view by the building occupants, including underneath countertops, inside cabinets and closets, and all equipment rooms.

H. Interior: Areas inside the building exterior envelope that are not exposed to the outdoors.

I. Exterior: Areas outside the building exterior envelope that are exposed to the outdoors, including building crawl spaces and loading dock areas.

J. Unconditioned Space: Interior space that is not temperature-controlled by cooling and/or heating system. Includes attics, chases, unconditioned living spaces and non-conditioned equipment rooms.

1.04. QUALITY ASSURANCE

K. All piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

L. All insulation, jacket, adhesives, mastics, sealers, and accessories utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement.

1. Certificates to this effect shall be submitted along with submittal data.

2. No material shall be used that, when tested by the ASTM E84-89 test method, is found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

M. Application Company Qualifications: Company performing the Work of this Section shall have minimum three (3) years experience specializing in the trade.

N. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

O. All insulation shall be applied in strict accordance with these Specifications and with factory printed recommendations on items not herein mentioned. Unsightly, inadequate, damaged or water-soaked Work will not be acceptable.

P. Stainless Steel: Insulation applied on stainless steel shall meet requirements of ASTM C795 and NRC 1.36. These requirements are for prevention of external stress Corrosion Cracking (ESCC) for austenitic stainless steel.

1.05. SUBMITTALS

Q. Prepare a schedule of piping insulation showing systems insulated. For each system, show insulation type, thickness, temperature rating, and special conditions where applicable.

R. Submit product data for each piping system. Product data shall include but not be limited to the following:

1. Manufacturer's name

2. Insulation material and thickness

3. Jacket

4. Adhesives

5. Fastening methods

6. Fitting materials

7. Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings

8. Insulation installation details (manufacturer's installation instructions/details, Contractor's installation details, MICA plates where applicable)

9. Other appropriate data

S. Samples: When requested, submit three (3) samples of any representative size illustrating each insulation type.

T. Operation and Maintenance Data: Indicate procedures that ensure acceptable standards will be achieved. Submit certificates to this effect.

1.06. DELIVERY, STORAGE AND HANDLING

U. Deliver materials to the Project Site in original factory packaging, labeled with manufacturer's identification including product thermal ratings and thickness.

V. Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

W. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 - PRODUCTS

2.01. GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02. MANUFACTURERS

B. Insulation:

1. Owens-Corning
2. Certainteed Corporation
3. Johns Manville Corporation
4. Knauf Corporation
5. Armstrong/Armacell (Armaflex)
6. RBX Industries/Rubatex
7. FOAMGLAS (Cellular Glass) by Pittsburgh Corning

C. Jackets:

1. Childers Products Company
2. PABCO
3. RPR Products, Inc.
4. John Mansfield Speedline

5. Foamglas

D. Coatings, Sealants, and Adhesives:

1. Foster

2. Childers

2.03. INSULATION MATERIALS

E. Products shall not contain asbestos, lead, mercury, or mercury compounds.

F. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

G. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

H. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

I. Piping Insulation Type P1: Glass-Fiber, Preformed Pipe Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A with factory applied ASJ-SSL vapor barrier jacket with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I. Provide one of the following:

1. Owens Corning; Evolution Fiberglas Pipe Insulation.

2. Johns Manville; Micro-Lok Pipe Insulation.

3. Knauf; Earthwool 1000 degree Pipe Insulation.

J. Piping Insulation Type P2: Flexible Elastomeric Pipe Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials. Provide one of the following:

1. Armacell LLC; AP Armaflex

2. Aeroflex USA Inc; Aerocel

3. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

K. Piping Insulation Type P3: Handicap Lavatory and Sink Piping Insulation Kit:

1. Handicap lavatory and sink drain piping, P-trap, cold and hot water assemblies and valves shall be insulated with fully molded insulation kit specifically designed for handicap lavatories and sinks. ADA conforming.

2. Material shall be 3/16" thick molded closed cell vinyl with nylon fasteners, white finish and be self-extinguishing per ASTM D635, with K value of 1.17 BTU/in./hr./sq. ft./deg. F.

L. Piping Insulation Type P4: Preformed Cellular Glass: Comply with ASTM C 585, ASTM C 450. Provide one of the following:

1. Pittsburgh Corning; Foamglas

2.04. FIELD-APPLIED FABRIC-REINFORCING MESH

M. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe. Provide one of the following:

1. Foster Brand, Specialty Construction Brands, Inc; Mast-A-Fab.

2. Vimasco Corporation; Elastafab 894.

2.05. FIELD-APPLIED JACKETS

N. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

O. Piping Jacket Type J1: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; 40 mil thickness, roll stock ready for shop or field cutting and forming. Provide factory-fabricated fitting covers to match jacket. Provide one of the following

1. Johns Manville; Zeston.

2. Proto Corporation; LoSmoke

P. Piping Jacket Type J2: Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14. Provide factory-fabricated fitting covers or field fabricate covers only if factory-fabricated fitting covers are not available. Provide one of the following:

1. Provide Childers Brand Metal Jacketing Systems.

2. Provide shop fabricated smooth aluminum jacket 0.016".

2.06. TAPES

Q. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.

2. Thickness: 11.5 mils.

3. Adhesion: 90 ounces force/inch in width.

4. Elongation: 2 percent.

5. Tensile Strength: 40 lbf/inch in width.

6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

R. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.

2. Thickness: 6 mils.

3. Adhesion: 64 ounces force/inch in width.

4. Elongation: 500 percent.

5. Tensile Strength: 18 lbf/inch in width.

2.07. INSULATION INSERTS

S. Provide insert between support shield and piping on piping 1 1/2" diameter or larger. Inserts shall be factory fabricated of heavy density insulating material suitable for temperature. Insulation inserts shall not be less than the following lengths:

1. 1 1/2" to 2 1/2" pipe size 10" long

2. 3" to 6" pipe size 12" long

3. 8" to 10" pipe size 16" long

4. 12" and over 22" long

2.08. PIPE INSULATION ACCESSORIES

T. Vapor Retarder Lap Adhesive: Compatible with insulation.

U. Covering Adhesive Mastic: Compatible with insulation.

V. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12-inch centers.

W. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.

X. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.

Y. Adhesives: Compatible with insulation.

Z. Banding:

1. Aluminum bands, 3/4" x 0.02 inches

2. Stainless Steel, 304, 3/4" by 0.02 inches

PART 3 - EXECUTION

3.01. PREPARATION

A. Thoroughly clean all surfaces to be insulated as required to remove all oil, grease, loose scale, rust, and foreign matter. Piping shall be completely dry at the time of application. Insulating piping where condensate is occurring is unacceptable. Wet insulation is unacceptable and shall be removed and replaced before acceptance by the Owner.

B. Coordinate insulation installation with trade installing heat trace. Comply with requirements for heat tracing that apply to insulation.

C. Verify that piping has been tested for leakage before applying insulation.

3.02. GENERAL INSTALLATION REQUIREMENTS

D. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards, and shall conform to codes and ordinances of authorities having jurisdiction.

E. Installation of insulation and jacket materials shall be in accordance with manufacturer’s published instructions.

F. Handle and install materials in accordance with manufacturer’s instructions in the absence of specific instructions herein.

G. On exposed piping, locate insulation cover seams with the ridge of the lap joint is directed down.

H. Provide dams in insulation at intervals not to exceed 20 feet on cold piping systems to prevent migration of condensation or fluid leaks. Indicate visually where the dams are located for maintenance personnel to identify and also provide dams at butt joints of insulation at fittings, flanges, valves, and hangers.

I. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

J. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

K. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

L. Install insulation with longitudinal seams at top and bottom of horizontal runs.

M. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

N. Keep insulation materials dry during application and finishing.

O. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

P. Install insulation with least number of joints practical.

Q. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.

2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

R. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

S. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

T. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

U. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

V. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere and seal patches similar to butt joints.

W. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3.03. PENETRATIONS

X. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

Y. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

Z. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

AA. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

BB. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Comply with requirements in Section 15050 for firestopping and fire-resistive joint sealers.

CC. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 15050."

3.04. GENERAL PIPE INSULATION INSTALLATION

DD. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

EE. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket where concealed unions, check valve or piping specialties are insulated. Provide descriptive label at device under the insulation. For example at each union stencil with the word "union." Match size and color of pipe labels.

FF. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

GG. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.05. INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

HH. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

II. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

JJ. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

KK. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.06. INSTALLATION OF GLASS-FIBER PREFORMED PIPE INSULATION

LL. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on below-ambient surfaces, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

MM. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

NN. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with bands.

OO. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3.07. FIELD-APPLIED JACKET INSTALLATION

PP. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

QQ. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.08. FINISHES

RR. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

SS. Do not field paint aluminum jackets.

3.09. PIPING SYSTEMS INSULATION SCHEDULE

PIPING SYSTEMS INSULATION SCHEDULE					
Service	Insulation Type	Location	Jacket Type	Pipe Size	Insulation Thickness by Pipe Size
COLD PIPING					
Refrigerant Suction	P2	Interior	--	3.0" and	0.75"

		Concealed		smaller	
				4.0" and larger	1.0"
		Interior Exposed	J1	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Unconditioned	--	3.0" and smaller	0.75"
		Space		4.0" and larger	1.0"
		Exterior	J2	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Equipment Rooms	J1	3.0" and smaller	0.75"
		below 7.0" above floor		4.0" and larger	1.0"
Condensate					
		Exterior	J2	3.0" and smaller	0.5"
HOT PIPING					
Refrigerant Hot Gas	P2	Interior Concealed	--	3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Interior Exposed		3.0" and smaller	0.75"
				4.0" and larger	1.0"
		Unconditioned	--	3.0" and smaller	0.75"
		Space		4.0" and larger	1.0"
		Exterior	J2	3.0" and smaller	0.75"
				4.0" and	1.0"

				larger	
		Equipment Rooms		3.0" and smaller	0.75"
		below 7.0" above floor		4.0" and larger	1.0"

END OF SECTION 23 0086

SECTION 23 0090

SUPPORTS, HANGERS AND ANCHORS

PART 1 GENERAL

1.01. WORK INCLUDED

A. Inserts, Anchors, and Upper Attachments

B. Pipe Hangers, Rods, Supports, and Accessories

C. Fabricated Steel Support

1.02. QUALITY ASSURANCE

A. Design of pipe supporting elements shall be in accordance with ANSI B31.1

B. Fabrication and installation of pipe hangers and supports shall be in accordance with the following Manufacturers Standardization Society (MSS) Standards:

1. SP-58 Pipe Hangers and Supports: Materials, Design and Manufacture.
2. SP-69 Pipe Hangers and Supports: Selection and Application.
3. SP-89 Pipe Hangers and Supports: Fabrication and Installation Practices.

C. Steel angles, channels and plate shall be in accordance with ASTM A36, red primed or hot dipped galvanized for interior applications and hot galvanized for exterior applications.

D. Bolts, including nuts and washers, used for fabricating steel members shall be in accordance with ASTM A325 and shall be stainless steel or plated for corrosion protection. Plain steel components are unacceptable.

E. Welding of steel members shall be in accordance with AWS D1.1.

F. Steel supports for ducts, pipe anchors, pipe guides, and piping supported from below shall be fabricated in accordance with AISC Specification for the Design, Fabrication and Erection of Structural Steel for buildings. If required, the Contractor shall include the cost of the services of a structural engineer to design or review the system.

1.03. APPLICABLE PUBLICATIONS

A. Applicable sections of the publications listed below form a part of this Section. The publications are referenced by the basic designation only.

1. American Institute of Steel Construction (AISC)
2. American National Standards Institute (ANSI)
3. American Society for Testing and Materials (ASTM)
4. American Welding Society (AWS)
5. The Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS)

6. National Fire Protection Agency (NFPA)

7. Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA)

1.04. SUBMITTALS

A. Submit schedule indicating type of hanger to be used by system and pipe size. Include rod size for each hanger size.

B. Product data, along with installation operation and maintenance instructions, shall be included in the operation and maintenance manuals.

C. Provide shop drawings for fabricated steel supports.

PART 2 PRODUCTS

2.01. ACCEPTABLE MANUFACTURERS

A. Inserts, Anchors, and Upper Attachments:

1. Anvil International, Inc.

2. Carpenter Paterson, Inc.

3. Cooper B-Line, Inc.

4. Elecen Metal Products

5. Hilti

6. Unistrut

7. ITW Red Head

B. Pipe Hangers, Rods, Supports and Accessories:

1. Anvil International, Inc.

2. Carpenter Paterson, Inc.

3. Cooper B-Line, Inc.

4. Elcen Metal Products

5. Hilti

6. Unistrut

C. Fabricated Steel Support: As indicated on Drawings.

2.02. DESIGN REQUIREMENTS

A. Supports capable of supporting the pipe for all service and testing conditions. Provide 4-to-1 safety factor.

B. Allow free expansion and contraction of the piping to prevent excessive stress resulting from service and testing conditions or from weight transferred from the piping or attached equipment.

C. Design supports and hangers to allow for proper pitch of pipes.

D. For chemical and waste piping, design, materials of construction, and installation of pipe hangers, supports, guides, restraints, and anchors:

1. ASME B31.3.

2. MSS SP-58 and MSS SP-69.

3. Except where modified by this Specification.

E. For steam and hot and cold water piping, design, materials of construction and installation pipe hangers, supports, guides, restraints and anchors:

1. ASME B31.1

2. MSS SP-58 and MSS SP-69.

F. Check all physical clearances between piping, support system, and structure. Provide for vertical adjustment after erection.

G. Support vertical pipe runs in pipe chases at base of riser. Support pipes for lateral movement with clamps or brackets.

H. Place hangers on outside of pipe insulation. Use a pipe covering protection saddle for insulated pipe at support point.

I. Fabricated Steel Supports: As detailed on the drawings.

2.03. INSERTS AND ANCHORS

A. Inserts: MSS Type 18; malleable iron body and nut, galvanized finish, opening in top of insert for reinforcing rod, lateral adjustable.

B. Anchors: Steel shell and expander plug, snap off end fastener

2.04. HORIZONTAL PIPING HANGERS AND SUPPORTS

A. Select size of hangers and supports to exactly fit pipe size for bare piping, and around piping insulation with saddle or shield for insulated piping.

B. For suspension of non-insulated or insulated stationary pipe lines: Adjustable steel clevices, MSS Type I.

C. For suspension of non-insulated stationary pipe lines: Adjustable band hangers, MSS Type 7 or 9; or split pipe rings, MSS Type II.

D. For support of piping where horizontal movement due to expansion and contraction may occur, and where a low coefficient of friction is desired: Pipe slides and slide plates, MSS Type 35, including guided plate mounted on a concrete pedestal or structural steel support.

E. For support from floor stanchion, using floor flange to secure stanchion to floor: Adjustable pipe stanchion saddles, MSS Type 37 or 38, including steel pipe base support and cast-iron floor flange.

F. For suspension of pipe from two (2) rods where longitudinal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

G. For suspension of pipe from a single rod where horizontal movement due to expansion and contraction may occur: Adjustable roller hangers, MSS Type 43.

H. For support of pipe from a single rod where vertical adjustment is not necessary: Pipe roll stands, MSS Type 45.

I. For support of pipe where small horizontal movement due to expansion and contraction may occur, but vertical adjustment is not necessary: Pipe rolls and plates, MSS Type 45.

J. For support of pipe lines where vertical and lateral adjustment during installation may be required in addition to provision for expansion and contraction: Adjustment pipe rolls stands, MSS Type 46.

2.05. VERTICAL PIPING CLAMPS

A. Select size of vertical piping clamps to exactly fit size of bare pipe.

B. For support and steadying of pipe risers: Two-bolt riser clamps, MSS Type 8 or 42.

2.06. HANGER ROD ATTACHMENTS

A. Select size of hanger rod attachments to suit hanger rods.

B. For adjustment up to six (6) inches for heavy loads: Steel turnbuckles, MSS Type 13.

C. For use on high temperature piping installations: Steel clevices, MSS Type 14.

D. For use with split pipe rings, MSS Type II: Swivel turnbuckles, MSS Type15.

E. For attaching hanger rod to various types of building attachments: Malleable iron sockets, MSS Type 16 or 17.

F. Rods:

1. Size 3/8" and up: All thread steel rod electro galvanized. Sizing for pipe or equipment support as follows:

Copper Tube, Plastic	Steel, Cast Iron		
Pipe Size (Copper, Plastic)	Pipe Size (Steel, Cast Iron)	Rod Size	Max. Equip. Load
1/4" to 2"	1/4" to 2"	3/8"	730 lbs.
2-1/2" to 4"	2-1/2" to 3"	1/2"	1,350 lbs.
6"	4"	5/8"	2,160 lbs.
8" to 12"	6"	3/4"	3,230 lbs.
14"	8" to 12"	7/8"	4,480 lbs.
16"	14" to 16"	1"	5,900 lbs.
18" to 20"	18" to 20"	1-1/4"	9,500 lbs.
22" to 42"	22" to 42"	1-1/2"	13,800 lbs.

2. Rods may be reduced one size for double rod hangers with 3/8" minimum diameter, or

when other paragraphs require a minimum of 2 hangers per section, provided the minimum diameter of 3/8" is maintained.

G. For upper attachment for suspending pipe hangers from concrete: Concrete inserts MSS Type 18.

H. For attachment to top flange of structural shape: Top beam C-clamps, MSS Type 19.

I. For attachment to bottom flange of structural shape: Side beam or channel clamps, MSS Type 20 or 27.

J. For attachment to center of bottom flange of beams: Center beam clamps, MSS Type 21.

K. For attachment to bottom of beams where heavy loads are encountered and hanger rod sizes are large: Welded attachments, MSS Type 22.

L. For attachment to structural shapes: C-clamps, MSS Type 23.

M. For attachment to top of beams when hanger rod is required tangent to edge of flange: Top I-beams clamps, MSS Type 25.

N. For attachment to bottom of steel I-beams for heavy loads: Steel I-beam/WF-beam clamps with eye nut, MSS Type 28 or 29.

O. Steel brackets, for indicated loading:

1. Light duty, 750 pounds, MSS Type 31.

2. Medium duty, 1,500 pounds, MSS Type 32.

3. Heavy duty, 3,000 pounds, MSS Type 33.

P. For use on sides of steel beams: Side beam brackets, MSS Type 34.

2.07. SPRING HANGERS AND SUPPORTS

A. Select spring hangers and supports to suit pipe size and loading.

B. For control of piping movement: Restraint control devices, MSS Type 47.

C. For light loads where vertical movement does not exceed 1-1/4 inch: Springs cushion hangers, MSS Type 48.

D. For equipping Type 41 roll hanger with springs: Spring cushion roll hangers, MSS Type 49.

E. For retardation of sway or thermal expansion in piping systems: Spring way braces, MSS Type 50.

F. For absorbing expansion and contraction of piping system from hanger: Variable spring hangers, MSS Type 51; preset to indicated load and limit variability factor to 25%.

G. For absorbing expansion and contraction of piping system from base support: Variable spring base supports, MSS Type 52; preset to indicated load and limit variability factor to 25%; include flange.

H. For absorbing expansion and contraction of piping system from trapeze support: Variable spring trapeze hangers, MSS Type 53; preset to indicated load and limit variability factor to 25%.

I. Constant supports: Provide one of the following types, selected to suit piping system. Include

auxiliary stops for erection and hydrostatic test, and field load-adjustment capability.

1. Horizontal Type: MSS Type 54.
2. Vertical Type: MSS Type 55.
3. Trapeze Type: MSS Type 56.

2.08. SUPPLEMENTARY SUPPORTS

A. Where support spacing is more frequent than distance between structural members, provide steel angles, channels or beams sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer pipe support loads to structural members.

B. Where deflection of center of trapeze support exceeds 1/240 of distance between hanger rods, provide additional hanger rods.

C. Where multiple risers are supported within shafts, provide steel angles, channels or beams, sized to provide a deflection of less than 1/240 of span when fully loaded, to transfer loads to the concrete floor slab. Anchor supplemental supports to the slab, and provide resilient element where required by other Sections of this Division.

2.09. ACCESSORIES

A. Protective Shields, MSS Type 40: Carbon steel, galvanized minimum of 12" length sized for required insulation.

B. Protective Saddles, MSS Type 39: Carbon steel plate, minimum of 12" length, sized for required insulation.

C. Steel Turnbuckle, MSS Type 13: Forges steel, galvanized finish with locknuts. Rated at a minimum of 730 lbs. at 3/8" size.

D. Steel Clevis, MSS Type 14: Forged steel, galvanized finish with steel pin and cotter pin. Rated for a minimum of 730 lbs. at 3/8" size.

E. Weldless Eye Nut, MSS Type 17: Forges steel, galvanized finish. Rated for a minimum of 730 lbs. at 3/8" size.

2.10. PIPE INSULATION HANGER SHIELDS

A. Where hangers are placed outside the jackets of pipe insulation, provide shields equal to "Thermal Hanger Shields" as manufactured by Pipe Shields, Inc. or equivalent by Elcen Metal Products Company.

B. Shields shall consist of a 360-degree insert of high-density, 100 psi, waterproof calcium silicate, encased in a 360-degree galvanized sheet steel shield. Insert shall be same thickness as adjoining pipe insulation, and shall extend 1 inch beyond sheet metal shield in each direction on cold lines. Shield lengths and minimum sheet metal gauges shall be as directed below:

PIPE SIZE	SHIELD LENGTH	MINIMUM GAUGE
1/2" to 1-1/2"	4"	26
2" to 6"	6"	20
8" to 10"	9"	16

12" to 18"	12"	16
20" & Larger	18"	16

C. Shields shall be Model CS-CW, except for pipe roller applications: then provide Model CSX-CW.

D. At the Contractor's option, shop-fabricated galvanized metal shields may be provided based on approved shop drawings. Length and gauge of sheet metal shall be as specified above.

E. For all insulated piping 4” and larger, provide insulation insert at a minimum of 12” long. Insert shall extend a minimum of one inch beyond shield. Insulation inserts shall be minimum 12” long section of foam glass insulation.

2.11. METAL FRAMING: Provide products compliant with NEMA ML-1.

2.12. STEEL PLATES, SHAPES AND BARS: Provide products compliant with ANSI/ASTM A-36.

2.13. PIPE GUIDES: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of a bolted two-section outer cylinder and base, with a two-section guiding spider bolted tight to pipe or as shown on Drawings. Size guides and spiders to clear pipe, cylinder and insulation, if any. Provide guides of length recommended by manufacturer to allow indicated travel.

PART 3 EXECUTION

3.01. GENERAL REQUIREMENTS

A. Where applicable, install in accordance with the manufacturer's written installation instructions.

B. Where supports are in contact with copper pipe, provide copper plated support.

C. Where supports are in contact with glass, aluminum or brass pipe, provide plastic coating on supports.

D. Interior hangers, supports, including attachments, that are plain steel shall be primed and painted.

E. Hangers and supports, including attachments, exposed to weather or located in utility tunnels or accessible utility trenches or subject to spillage shall be hot dip galvanized after fabrication.

F. Fabricated steel supports exposed to weather or located in utility tunnels and accessible utility trenches or subject to spillage shall be primed and painted. Cut, welded, drilled or otherwise damaged surfaces of coating shall be repaired.

3.02. PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including but not limited to proper placement of inserts, anchors and other building structural attachments.

3.03. INSTALLATION OF HANGERS AND SUPPORTS

A. Install hangers, supports, clamps and attachments to support piping properly from building structure in compliance with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together in trapeze-type hangers where possible. Install supports with

maximum spacing as specified in this Section. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for small diameter pipe. Do no use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Support fire protection water piping independently of other piping

D. The location of hangers and supports shall be coordinated with the structural work to ensure that the structural members will support the intended load.

E. Provide hex head nut on rod at top and bottom of clevis hanger yoke, and at each rod connection to intermediate und upper attachment. Rod nuts shall be securely locked in place.

F. Hanger rods shall be subject to tensile loading only. Where lateral or axial movement is anticipated, use suitable linkage in hanger rod to permit swing.

G. Hangers shall be fabricated to permit adequate adjustment after erection while still supporting the load. Turnbuckles shall be provided where required for vertical adjustment of the piping.

H. Supports for vertical piping shall be located at each floor or at intervals of not more than 15 feet and at intervals of not more than 8 feet from end of risers. Where supports are provided on intermediate floors spaced 15 feet or less between floors, no additional supports are required other than those specified for end of risers.

I. A hanger or support shall be provided adjacent to each piece of equipment to ensure that none of the pipe weight is supported from the equipment.

J. Provide protective shields on all piping required to be insulated.

K. Provide protective saddles sized to match insulation thickness on all hot piping required to be insulated. Fill void between saddle and pipe with insulation as specified.

L. Provide turnbuckles on all hangers that require leveling or aligning.

M. Provide steel clevis where detailed and/or required.

N. Provide weldless eye nuts on hanger terminations where disassembly or swing may be required. Use in combination with steel clevis.

O. Supports

1. Provide additional supports at:

a. Changes in direction.

b. Branch piping and runouts over 5 feet.

c. Concentrated loads due to valves, strainers and similar items.

d. At valves 4 inches and larger in horizontal piping.

e. Support piping on each side of valve.

f. Brace hubless piping to prevent horizontal and vertical movement.

g. Where number of grooved couplings exceeds 3 between supports or provide continuous steel between supports.

2. Sanitary waste and vent, roof drains per UPC Section 316: Vertical supports are not required within 2.5 feet of wall penetrations for pipes 8 inches in diameter and smaller, and not more than 3 feet for 10 inches and larger.

3. Other piping support spacing shall be as scheduled on Drawing or as required by referenced standard.

3.04. HANGER SPACING

A. The maximum spacing between pipe supports for straight runs shall be in accordance with the following chart. If any deviation from the table exists within the manufacturer's written installation instruction, whichever spacing reflecting the smaller centerline to centerline dimension shall be used.

MAXIMUM HORIZONTAL PIPE HANGER AND SUPPORT SPACING TABLE

1. Steel Pipe (Schedule 40 & 80):
   Up to 1" ..... 7 ft. on center
   1-1/4" and greater ..... 10 ft. on center

2. Copper Pipe (Types L, K and M):
   Up to 1" size: ..... 5 ft. on center
   1-1/4" to 2-1/2" ..... 7 ft. on center
   3" and larger ..... 10 ft. on center

3. Ductile Iron and Cast Iron: Two hangers per section length.

4. Polyvinyl Chloride (PVC):
   Up to 1-1/2" ..... 3 ft. on center
   2" to 4" ..... 4 ft. on center
   5" to 8" ..... 5 ft. on center
   10" and larger ..... 6 ft. on center

5. Sprinkler and Standpipe: Pipe hangers to be as per NFPA-13 and NFPA-14 standards.

B. Hanger centerline spacing shall be reduced by 50% in areas of concentrated valves and/or fittings, also no more than a maximum distance of 12 inches from valves, fittings and/or couplings, or 24 inches from a change in direction.

3.05. ATTACHMENT TO STRUCTURE

A. For plain steel devices, prime and paint.

B. Adjust attachment location for proper alignment and no more than 4 degrees offset from a perpendicular alignment.

C. If proper alignment cannot be achieved from the existing building structure, provide a trapeze type support sized to handle the design load with a minimum safety factor of 5.

3.06. INSERTS

A. Contractor shall have inserts at site and dimensional location drawings ready at the beginning of the involved concrete work.

B. Install inserts by securing to concrete forms and inserting reinforcing rod through the opening provided in the insert in accordance with shop drawings.

C. Provide necessary supervision while concrete is being poured to correct any misalignment caused by the concrete.

3.07. INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B-31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bards to piping and to structure. Comply with ANSI B-31, with AWS standards, and with the Details shown on the drawings.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

D. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops and bends. Make provisions for preset of anchors as required, accommodating both expansion and contraction of piping.

E. Size anchor shell length to assure a minimum of 1" solid concrete remaining from shell and to concrete face.

3.08. INSTALLATION OF TRAPEZES OR PIPE RACKS

A. Light/Medium Duty: Assemble from standard manufactured metal framing systems, in accordance with manufacturer's recommendations.

B. Heavy Duty: Fabricate from structural steel shapes selected for loads required. Weld steel in accordance with AWS standards.

3.09. AUXILIARY STEEL

A. Furnish all miscellaneous structural members necessary to hang or support ductwork, piping, and mechanical equipment.

B. Notify Engineer of any adjustment necessary in main structural system for proper support of major equipment.

C. Fabricated Steel Supports: Steel for supports shall be saw cut, with sharp edges ground smooth. After fabrication, remove all foreign material, including welding slag and spatter, and leave ready for painting.

END OF SECTION

SECTION 23 0120

PIPING SPECIALTIES

PART 1 - GENERAL

1.01 Specific requirements for specialties indicated on drawings or in other sections of these specifications shall take precedence over items as specified in this section.

1.02 Submit brochures and other supportive product data for all items.

1.03 Ranges for thermometer, gages, or similar instruments shall be selected so that normal operation will be near center of scale. Range shall not be longer than required. Use compound gage where vacuum may be encountered.

1.04 Combination instruments for thermometers and gages will not be acceptable.

PART 2 - PRODUCTS

2.01 THERMOMETERS:

A. Thermometers shall be equal to Trerice Series BX9, 9-inch, adjustable type. Stem length shall be a minimum of 3/4 of the pipe diameter, plus well extension length. Use 12-inch stem length in tanks.

B. Provide brass wells and stems.

2.02 THERMOMETER WELLS:

A. Provide wells with extension neck for insulated piping.

B. Wells shall be Trerice Series 138 type.

C. Test wells to be Trerice Series 169 type with cap and chain.

2.03 GAGES:

A. Gages shall be equal to Trerice Series 800, 3-1/2-inch size.

B. Provide snubber and cock for each gage.

C. Provide coil syphon and cock for each steam gage.

D. Gauges shall be liquid filled.

2.04 TEST PLUGS:

A. Test plugs shall be equal to Peterson Engineering Company #110, 1/4" size, with brass body, dust cap and "Nordel" valve core material.

2.05 STRAINER:

A. "Y" Type (Haywood, Muessco, or Sarco):

1. 1/2" through 2": Haywood Model 80, bronze, 300 lb. WP, 500 lb. WOG or Haywood Model 80 iron body, 250 lb. WP, 900 lb. WOG. Provide Monel or stainless steel screen, blow-off

outlet, screwed ends.

2. 2-1/2" through 12": Haywood Model 80 iron body, 125 lb. SWP, 175 lb. WOG, brass screen, blow-off outlet, flanged ends.

B. Screens - Steam:

1. Monel or stainless steel.

2. Perforations - .057 diameter, 144 per sq. in.

C. Screens - Water:

1. Brass.

2. Perforations: Up to 2" - 1/10" diameter, 49 per sq. in.; 2-1/2" to 4" - 1/8" diameter, 32 per sq. in.; 5" up - 1/4" diameter, 8 per sq. in.

2.06 FLEXIBLE CONNECTORS:

A. Pumps and Chillers: Bellows Type 3, equal to Keflex #151-TR-1250, with 150 lb. flanges and tie rods. 150 psig maximum working pressure. 304 stainless steel. Bellows welded to flanges. Tie rods with chatter proof spacers. Unit rated at 800°F.

B. Coils, Valves, And Miscellaneous Equipment: Stainless steel braided hose type.

2.07 ELECTRICAL HEAT TAPE:

A. Heat tape shall be equal to Emerson Chromalox.

B. Electrical heat tape shall be installed where indicated on the drawings to prevent pipe freezing.

C. Heat tape shall be approved for use in hazardous areas as indicated and U.L. listed.

2.08 CALIBRATED BALANCE VALVE:

A. For valves 2” and smaller:

1. Bronze body.

2. Ball or globe type.

3. 250 psig at 250° F rating.

4. Threaded ends.

5. Calibrated orifice or venturi.

6. Meter connections with integral seals.

7. Memory stop.

B. For valves 2-1/2” and larger:

1. Iron or steel body.

2. Ball or globe type.

3. 125 psig at 250° F rating.

4. Flanged connection.

5. Calibrated orifice or venturi.

6. Meter connections with integral seals.

7. Memory stop.

C. Acceptable manufacturers:

1. Flow Design

2. Bell and Gossett

3. Taco

4. Armstrong

5. Nibco

PART 3 - EXECUTION

3.01 GAGES, THERMOMETERS, AND TEST PLUGS:

A. Provide thermometers in inlet and outlet piping of chillers, boilers, water heaters, air handling unit coils, and elsewhere as indicated on the drawings.

B. Provide gages on inlet and outlet piping of all pumps, except domestic hot water circulators, steam gages on boiler headers, and elsewhere as indicated on the drawings.

C. Arrange thermometers and gages so they might be read standing in a normal position on the floor.

D. Provide test plugs on inlet and outlet piping of all heat exchanger equipment not equipped with thermometers. This includes all heating and cooling coils in air handling units, fan coil units, and other terminal devices with coils.

E. Locate gages, thermometers, and test plugs as close as possible to equipment being monitored.

3.02 FLEXIBLE PIPE CONNECTORS:

A. Install flexible pipe connectors where indicated on the drawings.

B. Install connectors as close as possible to equipment inlets and outlets.

C. Support pipe work independently of flexible connectors. Brace and anchor piping as required to prevent movement of piping ends of flexible connectors and align all equipment, pipe work, and flanges so that no flexible connectors shall be misaligned and/or stressed beyond the manufacturer's recommended maximum limits.

3.03 HEAT TAPE:

A. Install the heat tape below the pipe insulation in a uniform distribution to obtain the watts/linear

foot as indicated.

B. Wiring installation shall be done in accordance with the NEC and the manufacturer's requirements.

C. Power for heat tape shall come from an emergency circuit. If no emergency circuit is available, the power shall come from a dedicated circuit, marked heat tape in the panel.

D. Unless indicated otherwise on the plans, install heat tape with a minimum capacity of 5 watts/foot.

E. Heat tape shall be thermostatically controlled and shall be preset to energize before freezing. An indicator light shall energize when the heat tape is "on."

END OF SECTION

SECTION 23 0160

MECHANICAL SYSTEMS INSULATION

PART 1 GENERAL

1.01 Provide required insulation for HVAC ductwork and plumbing piping.

1.02 All ductwork and piping is insulated unless otherwise noted.

1.03 SUBMITTTALS

A. Submit product data for each system. Product data shall include but not be limited to the following:

1. Manufacturer's name
2. Insulation material and thickness
3. Jacket
4. Adhesives
5. Fastening methods
6. Fitting materials
7. Manufacturer's data sheets indicating density, thermal characteristics, temperature ratings
8. Insulation installation details (manufacturer's installation instructions/details, Contractor's installation details, MICA plates where applicable)
9. Other appropriate data

1.04 QUALITY ASSURANCE

A. All ductwork and piping requiring insulation shall be insulated as specified herein and as required for a complete system. In each case, the insulation shall be equivalent to that specified and materials applied and finished as described in these Specifications.

B. All insulation, jacket, adhesives, mastics, sealers, etc., utilized in the fabrication of these systems shall meet NFPA for fire resistant ratings (maximum of 25 flame spread and 50 smoke developed ratings) and shall be approved by the insulation manufacturer for guaranteed performances when incorporated into their insulation system, unless a specific product is specified for a specific application and is stated as an exception to this requirement. Certificates to this effect shall be submitted along with Contractor's submittal data for this Section of the Specifications. No material may be used that, when tested by the ASTM E84-89 test method, is

found to melt, drip or delaminate to such a degree that the continuity of the flame front is destroyed, thereby resulting in an artificially low flame spread rating.

C. Application Company Qualifications: Company performing the Work of this Section must have a minimum of three (3) years' experience specializing in the trade.

D. All insulation shall be applied by mechanics skilled in this particular Work and regularly engaged in such occupation.

E. All insulation shall be applied in strict accordance with these Specifications and with adequate factory-printed recommendations on items not herein mentioned. Unsightly, inadequate, damaged or water-soaked Work will not be acceptable.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

2.02 HVAC PIPING:

A. Condensate Drain (Above Ground): Armstrong's "Armaflex AP" pipe insulation, 1/2" thick.

B. Refrigerant

1. Insulate with “Armaflex AP" pipe insulation, 1/2" thick for the following:

a. All Suction Lines.

b. Mixed Phase lines for ductless split systems.

c. Suction and Liquid lines for dedicated 100% outside air split systems.

2.03 MANUFACTURERS

A. CertainTeed Corporation.

B. Johns Manville Corporation.

C. Knauf Corporation.

D. Owens-Corning.

E. Unifrax 1 LLC (FyreWrap).

F. Armacell

2.04 INSULATION MATERIALS

A. Type D1: Flexible glass fiber; ASTM C553 and ASTM C1290; commercial grade; 'k' value of 0.25 at 75 degrees F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

B. Type D2: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; 0.002 inch foil scrim kraft facing for air ducts.

C. Type D3: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, ‘k’ value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable acrylic surface coating specifically formulated to:

1. Be no more corrosive than sterile cotton when tested in accordance with the test method for corrosiveness in ASTM C665.

2. Absorb no more than 3 percent by weight when tested in accordance with the test method for moisture vapor sorption in ASTM C1104.

3. Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM C1071, ASTM C1338, ASTM G21, and ASTM G22.

4. Show no signs of warpage, cracking, delaminating, flaming, smoking, glowing, or any other visibly negative changes when tested in accordance with the test method for temperature resistance in ASTM C411.

5. Have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

6. Meet the sound absorption requirements when tested in accordance with the test method for sound absorption in ASTM C423.

7. Show no evidence of continued erosion, cracking, flaking, peeling, or delamination when tested in accordance with the test method for erosion resistance in UL181.

D. Type D4: Fire Rated Grease Duct Insulation (High Temperature Flexible Blanket); 1-1/2-inch thick refractory grade fibrous fire barrier material with minimum service temperature design of 2,000 degrees F; aluminum foil laminated on both sides; with a minimum ‘k’ value of 0.25 and a minimum density of 6 lbs/cu ft; containing no asbestos. Listed by a nationally recognized testing laboratory (NRTL) UL to meet ASTM E 2336, ASTM E119, and with flame spread/smoke minimum rating of 25 / 50 when tested as per ASTM E84/UL 723.

E. Type D5: Outdoor Duct Insulation (Closed Cell Flexible Elastomeric Insulation); 1 inch thick material that has a service temperature range from –60 degrees F to 180 degrees F. This outdoor duct insulation meets ASTM C 177 or C 518 and shall have minimum ‘k’ value of 0.27 Btu-in. / hr-ft2- degrees F at minimum density measurement of 3 lb/cu ft. The insulation and outside surface must be protected with a white Thermo Plastic Rubber Membrane formulated to:

1. Be resistant to UV, and ozone, acid rain, and physical elements produced from outdoor weather per ASTM E 96 Procedure A.

2. Have aflame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with the test method for surface burning in ASTM E 84.

3. Show no evidence of continued erosion, delaminating, cracking, flaking, or peeling when tested in accordance with the test method for erosion resistance in UL181. Be resistant to mold growth resistance, ASTM G 21/C 1338 resistant to fungi, and resistant to bacteria growth per ASTM G 22.

F. Type D6: Ductliner (to be used in return air sound boots only), flexible glass fiber; ASTM C1071; Type II, 'k' value of 0.23 at 75 degrees F; 3.0 lb/cu ft minimum density; coating air side for maximum 4,000 feet per minute air velocity. The airstream surface must be protected with a durable polyacrylate copolymer emulsion specifically formulated to:

1. Not support the growth of fungus or bacteria, when tested in accordance with the test method for fungi resistance in ASTM D 5590 with "0" growth rating.

2. Act as a fungicidal protective coating: water based, VOC < 50 g/l. Fungicidal coating must be EPA registered for use in HVAC duct systems. Manufacturer: H.B. Fuller Construction Products Inc., Foster 40-20 (white) or 40-30 (black) Fungicidal Protective Coating or approved equal. Coatings may also be used to repair damage to duct liner insulation.

G. High Density Duct Insulation Insert, see Type D2.

2.05 INSULATION ACCESSORIES

A. Adhesives: Waterproof vapor barrier type, meeting requirements of ASTM C916; Childers CP-82 or Foster 85-20/85-60.

B. Weather Barrier: Breather Mastic: Childers CP-10/CP-11 or Foster 46-50 White.

C. Vapor Barrier Coating: Permeance - ASTM E 96, Procedure B, 0.08 perm or less at 45-mil dry film thickness, tested at 100F and 50%RH; Foster 30-65 or Childers CP-34

1. When higher humidity levels may be of concern, only specify the following fungus/mold resistant coating: Foster 30-80 AF (anti-fungal). Coating must meet ASTM D 5590 with 0 growth rating**

D. Reinforcing Mesh: 10x10 or 9x8 glass mesh; Foster Mast a Fab or Childers #10

E. Jacket: Pre-sized glass cloth, minimum 7.8 oz/sq yd.

F. Type D4 Insulation Adhesive: Fire resistive to ASTM E84, Childers CP-82 or Foster 85-20.

G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

H. Joint Tape: Glass fiber cloth, open mesh.

I. Tie Wire and Wire Mesh: Annealed steel, 16 gage.

J. Stainless Steel Banding: 3/4-inch wide, minimum 22 gage, 304 stainless.

K. Armaflex 520, 520 BLV, or Foster 85-75 contact adhesive.

L. Armatuff 25 white seal seam tape.

PART 3 EXECUTION

3.01 GENERAL

A. The application of all insulation shall be performed by experienced mechanics, regularly employed in the trade, in a neat and workmanlike manner. Unless otherwise specified to a greater quality, the application of all insulation shall be in accordance with the manufacturer's recommendations.

B. Omit insulation from the following items:

1. Exposed plated plumbing pipe.

2. Vents to atmosphere, discharge from safety and relief valves, overflow pipes, and hot only drain pipes.

3. Valves, unions, flanges, traps, strainers, and devices in HOT ONLY piping.

C. Foil-Faced (FF) Duct Insulation shall comply with NFPA Standards 90A and 90B.

D. All exposed ends of pipe insulation shall be pointed up neatly with appropriate insulating cement, or use pre-molded PVC end caps on cold only piping and preformed aluminum end caps on dual-temp, hot or steam piping.

E. Provide high density insert at duct hangers. Maintain vapor barrier between insulation and duct hanger. Do not insulate duct hangers or supports.

3.02 DUCT AND PIPE PREPARATION

A. Verify that piping and ductwork has been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

C. Maintain required ambient temperature during and after installation for a minimum period of 24 hours.

3.03 ARMAFLEX PIPE INSULATION

A. Apply in strict accordance with latest edition of Armstrong's "Installation Instructions to the Contractor". Joints and seams shall be sealed moisture tight without gaps and openings in the insulation

3.04 INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Extend duct insulation without interruption through walls, floors, and similar penetrations, except where otherwise indicated.

D. Provide external insulation on all round ductwork connectors to ceiling diffusers and on top of diffusers as indicated in the Ductwork Insulation Application and Thickness Schedule and the Drawings. Secure insulation to the top of ceiling diffusers with UL181B-FX listed polypropylene duct tape Do not insulate top of ceiling diffuser if it is used in ceiling return air plenum or in an open space with no ceiling.

E. Flexible and Rigid fiberglass insulation (Types D1 and D2) application for exterior of duct:

1. Secure flexible insulation jacket joints with vapor barrier adhesive, tape. Tape shall be UL181B-FX listed polypropylene duct tape.

2. Install without sag on underside of ductwork. Use 4-inch wide strips of adhesive on 8-inch centers and mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3. Insulate standing seams and stiffeners that protrude through the insulation with 1-1/2 inch thick, unfaced, flexible blanket insulation. Cover with reinforcing mesh and coat with vapor barrier finish coating.

4. On circumferential joints, the 2-inch flange on the facing shall be secured with 9/16 inch outward clinch steel staples on 2-inch centers, and taped with minimum 3-inch wide strip of glass fabric and finish coating.

5. Vapor seal all seams, joints, pin penetrations and other breaks with vapor barrier coating reinforced with reinforcing mesh.

F. Duct Liner (Type D3 or D6) application for interior of return air sound boots or return air plenums:

1. Secure insulation with 100 percent coverage of duct liner adhesive, pins and clips not more than 18 inches on center.

2. Secure bottom of duct insulation using alternate single and double clips. The first pin will secure the insulation and the second clip will be used to secure the cladding. Isolate the exterior clip from the cladding by using two 1/8 inch closed cell neoprene (Armaflex) washers on either side of the cladding. Predrill holes in cladding and avoid contact with pin during installation.

3. For round duct, secure insulation with 100 percent coverage of duct liner adhesive. Secure cladding with 3/4 inch, 0.020 inch stainless steel bands on 12-inch centers.

4. For joints and overlaps, fold cladding to form a double thickness hem 2 inches minimum. Seal with a non-shrink, non-hardening sealing compound.

5. Type D6: Provide fungicidal coating in air handlers ten feet on either side, first ten feet downstream of cooling coils, ten feet downstream of mix boxes, in mechanical rooms or as otherwise specified in potentially high humidity areas in the duct system shall be coated with an fungicidal coating; EPA registered for use in HVAC duct systems at a coverage rate of 80 ft2/gallon.

G. Insulation (Type D4) application for exterior of grease ducts:

1. External duct wrap system requires two (2) 1.5-inch layers of lightweight, flexible wrap overlapped to provide an effective fire barrier. The barrier is installed in 24-inch or 48-inch wide sections. Insulation pins are welded in certain locations to maintain the fire barrier material up against the duct.

2. Grease duct doors to be installed so the door can be removed and re installed and meet code requirements.

3. Install duct wrap as tested per manufacturer's instructions to assure the duct wrap is mechanically attached per the manufacturer's spacing of bands or weld pins.

4. Vertical and horizontal members of the support hanger system shall be wrapped with one layer of the insulation. Vertical and horizontal portions shall be wrapped independent of one another. The horizontal hanger shall be removed from the vertical support rods and wrapped and then immediately replaced so that an adjacent horizontal support can be removed, wrapped, and reinstalled. The end of the threaded vertical rod shall extend 6-inch past the horizontal member at the beginning of the installation.

5. Penetrations: Where ducts penetrate fire rated walls, floors and roofs, the duct wrap shall be used in conjunction with a firestop system that is listed by a nationally recognized laboratory and rated for penetration of a rated wall or floor by the fire rated grease duct system used.

H. Insulation (Type D5) application for outdoor ducts:

1. Horizontal ductwork located outdoors shall be sloped at a minimum 2-degree angle to prevent the accumulation of water on top of the finished insulated duct. Support members that connect directly to the ductwork are to be insulated with this same material. Keep compression or sharp creases of outdoor insulation to a minimum by distributing the weight of the duct resting on horizontal duct support members.

2. Follow the insulation manufacturer's installation instructions and procedures to assure the ductwork is properly insulated and that the insulation will meet the manufacturer's warranty requirements.

I. All ductwork, accessories, and all plenums including metal and masonry construction, etc., shall be insulated as indicated on the Drawings, as specified herein and as required for a complete system. In each case, the insulation shall be equal to that specified and materials applied and finished as described in these Specifications.

J. Flexible ductwork connections to equipment shall not be insulated.

K. Where vapor barriers are required, the vapor barrier shall be on the outside. Extreme care shall be taken that the vapor barrier is unbroken. Joints, etc., shall all be sealed. Where insulation

with a vapor barrier terminates, it shall be sealed off with the vapor barrier being continuous to the surface being insulated. Ends shall not be left raw.

L. Extreme care shall be taken in insulating high and medium pressure ductwork including all ductwork between the fan discharge and all mixing boxes to ensure the duct is not pierced with sheet metal screws or other fasteners. All high and medium pressure ducts in these Specifications are classified as high velocity ductwork.

M. Where canvas finish is specified use lagging adhesive/coating to prevent mildew in securing canvas. Do not use wheat paste. Use only anti-fungal lagging adhesive that adheres to ASTM D 5590 with 0 growth rating. (Foster 30-36AF, Childers CP-137AF). In addition, cover all exterior canvas-covered insulation with a fire retardant weather barrier mastic.

N. All supply ductwork in the Project shall be insulated; all exhaust and fume hood exhaust ductwork shall not be insulated, unless used for energy recovery purposes or noted on drawings.

O. Flexible round ducts shall be factory insulated.

3.05 INSPECTION

A. Visually inspect the completed insulation installation per manufacturers recommended materials, procedures and repair or replace any improperly sealed joints.

B. Where there is evidence of vapor barrier failure or “wet” insulation after installation, the damaged insulation shall be removed, duct surface shall be cleaned and dried and new insulation shall be installed.

3.06 DUCTWORK INSULATION APPLICATION AND THICKNESS SCHEDULE

Ductwork System	Application	Insulation Type	Insulation Thickness
Supply Air (Hot, Cold, Combination)	Outside of Mechanical Rooms	D1	2"
	Inside of Mechanical Rooms	D2	1-1/2"
Return Air, Relief Air, and Exhaust Air	All	D1	1"
Outside Air	Treated and Untreated	D1	2"
Kitchen Grease Hood Exhaust Air	All	D4	3"
Duct mounted coils	Inside of Mechanical Rooms	D2	2”
Terminal Unit Heating Coils	All	D1	2”
Supply Air Diffusers	Top of Diffuser	D1	2"
Supply Air Duct	Outdoor Environment	D5	2”
Return, Exhaust Air Duct	Outdoor Environment	D5	1-1/2"
Return Air Sound Boots/Elbows/Return Air Plenums	All	D6	1"

END OF SECTION 23 0160

SECTION 230184
REFRIGERANT PIPING

PART 1 - GENERAL

1.01 Do not vent refrigerants to the atmosphere. Install new systems using recovering methods. Evacuate and recover existing systems to be modified or removed.

1.02 Submit piping materials, fittings, and refrigeration accessories.

PART 2 - PRODUCTS

2.01 REFRIGERANT PIPING:

A. Pipe: Type "K" copper, soft-drawn. Soft-drawn may be used where bending is required on 1-3/8" O.D. and smaller. All other shall be Type "L" Copper, hard-drawn, marked "ACR".

B. Fittings: Wrought copper or forged brass for refrigerant use.

PART 3 - EXECUTION

3.01 REFRIGERANT PIPING:

A. To be installed by machine mechanics skilled in this type work, and in accordance with recognized industry standards.

B. Make joints with "Sil-Fos" backed with nitrogen.

C. Piping and specialties to be sized and installed as recommended by the manufacturer of refrigerant piping.

D. Pre-charged lines may be used with approval of Engineer. These lines shall be installed as recommended by the unit manufacturer. Check and adjust charge after installation.

E. Isolate piping from building structure to prevent transmitting equipment vibration.

F. Installation:

1. Minimum Requirements: Protect refrigerant system during construction against entrance of foreign matter, dirt and moisture; have open ends of piping and connections to compressors, condensers, evaporators and other equipment tightly capped until assembly. Pass nitrogen gas through the pipe or tubing to prevent oxidation as each joint is brazed. Cap the system with a reusable plug after each brazing operation to retain the nitrogen and prevent entrance of air and moisture.

2. Testing:

a. General: Every refrigerant containing part of every system that is erected on the premises, except compressors, condensers, evaporators, safety devices, pressure gages, control mechanisms and systems that are factory tested, shall be tested and proved tight after complete installation, and before operation. The high and low side of each system shall be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure-relief device protecting the high or low side of the system,

respectively.

b. Test Medium: Oxygen, or any combustible gas, or combustible mixture of gases shall not be used within the system for testing. The means used to build up the test pressure shall have either a pressure-limiting device or a pressure-relief device, and a gage on the outlet side. Set the pressure-relief device above the test pressure but low enough to prevent permanent deformation of the system components.

c. System Test and Charging: Recommended by the equipment manufacturer or as follows:

1) Connect source or refrigerant to charging connection and introduce enough refrigerant into system to raise the pressure to 10 psig. Close valves and disconnect refrigerant drum. Test system for leaks with halide test torch or other approved method suitable for the test gas used. Repair all leaking joints and retest.

2) Connect a source of dry nitrogen to charging valve and bring test pressure to design pressure for low side and for high side. Refer to Table For Test Pressures. Test entire system again for leaks.

3) Evacuate the entire refrigerant system by the triplicate evacuation method with a vacuum pump equipped with an electronic gage reading in microns. Pull the system down to 100 microns and hold for four hours then break the vacuum with dry nitrogen (or refrigerant). Repeat the evacuation two more times breaking the third vacuum with the refrigeration to be charged and charge with the proper volume of refrigerant.

END OF SECTION

SECTION 23 0710

HVAC SHEET METAL

PART 1 - GENERAL

1.01 SCOPE:

A. All low pressure duct work including supply, exhaust, and outside air to complete the systems as shown on the Drawings or specified herein.

1.02 SUBMITTALS:

A. Submit the following:

1. Air distribution devices.
2. Life safety dampers and doors.
3. Flexible duct.
4. Flexible connections.
5. Access doors and duct access doors.
6. Turning vanes.
7. Duct take-off, fittings.
8. Roof outside air intake.
9. Duct sealants.
10. Duct leak tests.

1.03 GOVERNING PUBLICATIONS AND AUTHORITIES:

A. ASHRAE "Guide".

B. SMACNA "Low Velocity Duct Construction Standards".

C. Underwriters' Laboratories, Inc.

D. NFPA Pamphlets No. 90A, 90B, 91 and 96.

PART 2 - PRODUCTS

2.01 DUCT MATERIALS:

A. Galvanized steel sheets shall be lock-forming quality (LFQ), shall have a galvanized 690 zinc coating of 1-1/4 oz. total for both sides of one square foot, and the gauge of galvanized steel sheets shall be as prescribed by the latest edition of SMACNA for pressure classification of ductwork.

B. Aluminum sheets shall be made from an aluminum base alloy having not more than 0.5% copper (for corrosion resistance), a minimum tensile strength of 16,000 psi and the ability to satisfactorily make a Pittsburgh lock seam without splitting.

2.02 FLEXIBLE CONNECTIONS:

A. Flexible connections shall be made on duct connections of air moving equipment greater than 2000 CFM or as required for equipment installation.

B. Connections shall be made of 30 ounce woven glass fabric; fire-, water-, and weather-resistant fabric equal to “Ventfab”, double coated with neoprene "Ventglas", or equal. Canvas connections to give no less than 3" clear break between metals jointed. Insulate with 1" minimum fiberglass duct wrap with a vapor barrier facing of foil reinforced kraft. Seal with reinforced aluminum tape.

C. Flexible connections on exterior shall be protected from weather with sheetmetal cover which shall be coated for protection same as ductwork.

D. Connections in high pressure systems, fume hoods, and for those exposed to the weather shall be made from "Ventglas", neoprene coated glass fabric.

2.03 ACCESS DOORS:

A. Access doors to 16" by 24" size shall be "Ventlock" stamped insulated access doors.

B. Larger access doors shall be double panel construction with one inch thick 1.5 pcf density rigid insulation between panels. Doors with largest dimension over 24", but less than 48", shall use "Ventlock" series 200 latches, hinges and gasketing, and construction shall be 22 gage galvanized steel. Doors with largest dimension over 48" shall use "Ventlock" series 300 latches, hinges and gasketing, and construction shall be 20 gage galvanized steel.

C. Provide vision panels on access doors for fire dampers and control dampers.

2.04 FLEXIBLE DUCT:

A. Low Pressure: furnish and install, where indicated on the drawings, flexible metal insulated round ductwork, factory fabricated, listed under U.L. #181, Class 1 and NFPA 90A, capable of a minimum centerline bend radius equal to duct inside diameter. Insulation shall be 1-1/2" thick, 3/4 lb. density fiberglass blanket, maximum "K" value of 0.25 btu-in/hr-ft5-EF., and vapor barrier shall be neoprene coated fiberglass fabric laminated to aluminized polyester film. Flexible duct shall be rated for 10" positive and 2" negative static pressure.

B. Vinyl or non- aluminized vapor barriers will not be allowed. Maximum runouts shall not exceed length indicated on drawings in notes or details.

2.05 AIR DISTRIBUTION DEVICES:

A. General:

1. All outlet grilles shall have gaskets.

2. Furnish opposed blade volume controls on all supply outlets and return grilles.

B. Devices: Devices shall be as scheduled on the drawings.

2.06 LIFE SAFETY DAMPERS:

A. Dampers shall be equal to those manufactured by the Ruskin Corporation or Greenheck.

B. Dampers shall be U.L. listed.

C. Fire, smoke or combination fire/smoke dampers shall be provided in rated assemblies requiring them.

D. All dampers, methods and location of installation shall comply with the requirements of the International Building Code, National Fire Protection Association and all authorities having jurisdiction. In the case of discrepancies, most stringent requirements shall dictate

installation.

E. Fire and smoke dampers shall be provided with an approved means of access, large enough to permit inspection and maintenance of the damper and its operating parts. Access shall be provided on either side of damper assemblies.

F. Access shall not affect the integrity of fire-resistance-rated assemblies. The access openings shall not reduce the fire-resistance rating of the assembly.

G. Provide access door minimum 12" x 12".

H. Access points shall be permanently identified on the exterior by a label having letters not less than 0.5 inch (12.7 mm) in height reading: fire/smoke damper, smoke damper or fire damper.

I. Access doors in ducts shall be tight fitting and suitable for the required duct construction. Contractor shall install dampers in accordance with the following:

J. Fire dampers shall be constructed and tested in accordance with UL Safety Standard 555. Dampers shall have an hourly rating as indicated on the drawings, a 212°F fusible link, and shall include a UL label.

K. All outlet grilles shall have gaskets.

L. Contractor shall furnish opposed blade volume controls on all supply outlets and return grilles.

M. Dampers shall be equipped for vertical or horizontal installation as required by the location.

N. Manufacturer’s integral sleeves and frames may be used at the contractor's option.

O. Dampers shall be provided which are tested and rated for design duct velocity and pressure.

P. Dampers rating shall meet or exceed the rating of the wall in which it is housed.

Q. Contractor shall install fire or smoke or combination dampers in all rated walls as necessary to maintain the integrity of all rated walls whether indicated on the plans or not.

2.07 ACCESSORIES:

A. Manufactured Turning Vanes: Furnish and install single thickness, multiple radius, airfoil steel turning vanes. Static pressure loss for square ducts shall be no more than 20% of velocity head. Turning vanes shall be furnished with a mounting plate to facilitate installation in ductwork.

B. Manual Balancing Damper:

1. Square or Rectangular: Minimum 16 ga. body and 18 ga. blades, equal to Ruskin or Greenheck with vinyl blade seal and locking hand operator quadrant.

2. Round: Minimum 20 ga. body and 22 ga. blades, equal to Ruskin or Greenheck with locking hand operator

C. Control Dampers:

1. Control dampers shall be furnished by AHU Manufacturer or Control System.

D. All dampers shall be capable of 100% seal off.

PART 3 - EXECUTION

3.01 GENERAL:

A. All ductwork not specifically indicated on drawings or specified elsewhere to be high-pressure duct shall be fabricated, braced and erected in accordance with SMACNA "Low Velocity Duct Construction Standard" or the latest edition of ASHRAE "Guide".

B. Ductwork shall be galvanized steel unless otherwise noted.

C. Stainless steel and aluminum ductwork shall welded seam.

D. Adhere to drawings as closely as possible. However, where required to meet structural or other interferences vary the run and shape of ducts and make offsets during progress of work. Duct routes shall be established and field measurements shall be taken before duct work is fabricated. Where pipes or other items are "taken-in" to the duct, streamline collars shall be formed and placed around the item. If collar obstructs more than 20% of the cross sectional area, the duct shall be enlarged to accommodate obstruction.

E. All changes of direction and elbows shall be fitted with turning vanes. Standard radius elbows may be used if space permits.

F. Ductwork shall be free of any objectionable self-generating noise or rattles.

G. Furnish and install shop fabricated ductwork. Pre-assemble work in shop to the greatest extent possible, so as to minimize field assembly of systems. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible.

H. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.

I. Duct Sealing: All ductwork, regardless of system pressure classification, shall be sealed in accordance with Seal Class A, as referenced in SMACNA Standards. All transverse joints, longitudinal seams, and duct wall penetrations shall be sealed.

1. All seams and joints in shop and field fabricated ductwork shall be sealed by applying duct sealant complying with manufacturer’s recommendations. Tapes recommended by the sealant manufacturer may used in addition to sealant to achieve leakage limit requirements.

2. Sealant shall be water based latex UL 181A-M sealant with flame spread of 0 and smoke developed of 0. Sealants shall be Hard Cast Iron Grip 601, Ductmate Pro Seal, Foster 32-19, Childers CP-146 or Design Polymerics DP 1010.

3. Sealing tapes shall be from the same manufacturer as duct sealants.

4. Sealer shall be rated by the manufacturer and shall be suitable for use at the system pressure classification of applicable ductwork.

5. Except as noted, oil or solvent-based sealants are specifically prohibited.

6. For exterior applications, “Uni-Weather” (United McGill Corporation), solvent-based sealant, or Foster 32-19 shall be used.

J. Support materials shall be hot dipped galvanized steel fasteners, anchors, rods, straps, trim and angles. (Support duct with all thread rods and unistrut as equal trapeze hangers).

K. Install air flow measuring stations, furnished by Control Contractor, where indicated on the drawings.

3.02 MANUAL BALANCING DAMPERS:

A. All low pressure branch ducts on either supply, return or exhaust shall be provided by some means of balancing in addition to dampers at registers.

B. Splitter dampers shall be made of at least the same thickness material as duct (minimum thickness 22 gage). They shall be securely hinged at air leaving edge and made of 2 thicknesses so that entering edge presents a rounded surface to air flow.

C. Butterfly dampers shall be made of 16 gage galvanized steel. Butterfly dampers may be used in widths up to 10" wide. Dampers that require blades over 10" wide shall be multi-blade louver dampers.

D. Multi-blade louver dampers used for balancing shall be of the opposed blade type. Damper blades shall be constructed of 16 gage steel. Individual blade width shall not exceed 10" and blade length shall not exceed 48".

E. All dampers shall be so constructed and installed that there shall be no vibration due to air flow over damper.

F. Extend all handles and levers to outside of insulation.

3.03 ACCESS DOOR:

A. Access doors shall be provided at all dampers, equipment in duct and as indicated on drawings.

B. Access doors shall be minimum of 12" X 12" unless a larger size is required for maintenance of equipment or a smaller size must be used because of small duct size.

C. Provide access doors at all fire dampers, smoke dampers, humidifiers, and as indicated on the drawings.

3.04 FLEXIBLE CONNECTIONS:

A. Furnish and install sound isolating flexible connections on the inlet and outlet of each fan and unit to which duct connectors are made.

B. At least one inch slack shall be allowed in these connections to insure that no vibration is transmitted from fan to ductwork.

C. The fabric shall either be folded in with the metal or attached with metal collar frames at each end to prevent air leakage.

3.05 FLEXIBLE DUCT

A. Maximum runout shall not exceed lengths indicated on drawings.

B. Ducts shall be supported at intervals indicated in SMACNA and not laid on top of ceiling.

C. Minimum bend radius shall be as recommended by manufacturer.

D. Ducts shall be run straight and true with minimum offsets, and with excess duct lengths removed.

E. Connections to ducts and air devices shall be with minimum of one duct diameter straight into connection (kinked or pinched installations restricting flows are not acceptable).

F. Connections to duct and air devices shall be air tight.

3.06 TESTS:

A. Test duct systems in accordance with SMACNA latest edition of HVAC Air Duct Leakage Test Manual to achieve air tight systems not exceeding the limits outlined in the manual. Submit test results.

END OF SECTION

SECTION 23 0990
TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.01 SUMMARY:

A. This section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities and temperatures of the mechanical systems as required to meet design specifications, and recording and reporting the results.

1. Test, adjust, and balance the following mechanical systems:

a. Supply air systems, all pressure ranges.

b. Return air systems.

c. Exhaust air systems.

d. Outside air systems.

e. Verify control system operation.

2. Contractor shall:

a. Put heating, ventilating, and air conditioning systems and equipment into full operation and continue the operation of same during each working day of testing and balancing.

b. Allow the air balance agency to schedule this work in cooperation with other trades involved and comply with the completion date.

c. Make available to the balance agency a complete copy of submittal data on mechanical equipment including pump performance curves, fan curves, manufacturer's balancing factors and other manufacturers ratings for installed equipment.

d. Make any changes in pulleys, belts, and dampers or the addition of dampers as required for correct balance as recommended by TAB Contractor, at no additional cost to the Owner.

e. Have strainers and filters clean prior to starting of testing and balancing activity.

B. This section does not include:

1. Specifications for materials for patching mechanical systems.

2. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation

requirements.

3. Requirements and procedures for piping and ductwork systems leakage tests.

1.02 DEFINITIONS:

A. Systems testing, adjusting, and balancing is the process of checking and adjusting building environmental systems to produce design objectives. It includes:

1. Balance of air distribution;

2. Adjustment of total system to provide design qualities;

3. Electrical measurement;

4. Verification of performance of equipment and automatic controls;

B. Test: To determine quantitative performance of equipment.

C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).

D. Balance: To proportion flows within the distribution system (mains, branches, and terminals) according to specified design quantities.

E. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting and balancing.

F. Terminal: The point where controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

1.03 SUBMITTALS:

A. Agency Data: Submit proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified below.

B. Technicians Data: Submit proof that the Test and Balance Staff assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified below.

C. Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

D. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems.

E. Sample Forms: Submit sample forms.

F. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Technician. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a

true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below.

G. Draft Reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

H. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final reports.

I. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide contents of binder into the below listed divisions, separated by divider tabs:

1. General Information and Summary

2. Air Systems

4. Temperature Control Systems

J. Report Contents: Provide the following minimum information, forms and data:

1. General Information And Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor and Project. Include addresses, and contact names and telephone numbers. Also include a sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Technician. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.

2. The remainder of the report shall contain the appropriate forms for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

3. Air systems report shall include the following:

a. blower RPM;

b. motor full load amperes and voltages;

c. system static pressures, suction and discharge;

d. cfm outside air (for demand controlled ventilation with CO_2 sensors, provide airflow readings at 2 different CO_2 levels;

e. entering air temperatures; DB/WB

f. leaving air temperatures; DB/WB

g. main supply, return, and exhaust air ducts cfm, (pitot transverse);

h. each diffuser, grille and register cfm. (Balance to within +/-10% of design requirements and pressure relationships shown on drawings.)

i. each grille, diffuser, and register shall be identified as to location and area;

j. copies of start-up logs;

k. space temperatures and humidity readings; DB/WB

l. pressure drops across coils, filters, dampers, and other equipment in ducts.

m. pressure profiles of each system.

n. sheave size, brand name, and number.

o. belt quantity, stock name, and number.

K. Calibration Reports: Submit proof that required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of 6 months prior to starting the project.

1.04 QUALITY ASSURANCE:

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

2. The independent testing, adjusting, and balancing agency shall be certified by National Environmental Balancing Bureaus (NEBB) or Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project, and having at least one Technician, certified by NEBB or AABC.

B. Codes and Standards:

1. NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems".

2. AABC: "National Standards for Total System Balance".

3. ASHRAE: ASHRAE Handbook, Current Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

C. Pre-Balancing Conference: Prior to beginning testing, adjusting, and balancing procedures, schedule and conduct a conference with the Contracting Officer and representatives of installers of the mechanical systems. The objective of the conference is final coordination

and verification of system operation and readiness for testing, adjusting, and balancing.

1.05 PROJECT CONDITIONS:

A. Systems Operation: Systems shall be fully operational prior to beginning procedures.

1.06 ACCEPTANCE:
The Contracting Officer will not accept the building until the systems have been properly started, balanced, and the TAB Report is approved.

PART 2 - PRODUCTS: NOT USED

PART 3 - EXECUTION

3.01 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING:
Before operating the system, perform these steps:

A. Obtain design drawings and specifications and become thoroughly acquainted with design intent.

B. Obtain copies of approved shop drawings of air handling equipment, outlets (supply and return) and temperature control diagrams.

C. Compare design to installed equipment and field installations.

D. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.

E. Check filters for cleanliness.

F. Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.

G. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.

H. Determine best locations in main and branch ductwork for most accurate duct traverses.

I. Place outlet dampers in full open position.

J. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.

K. Verify that motors and bearings have been lubricated.

L. Check fan belt tension.

M. Check fan rotation.

3.03 MEASUREMENTS:

A. Provide required instrumentation to obtain proper measurements, calibrated to the tolerances specified in referenced standards. Instruments shall be properly maintained and protected against damage.

B. Provide instruments meeting the specifications of the referenced standards.

C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

D. Apply instrument as recommended by the manufacturer.

E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

3.04 PERFORMING TESTING, ADJUSTING, AND BALANCING:

A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

C. Patch insulation, ductwork, and housings, using materials identical to those removed.

D. Seal ducts and piping, and test for and repair leaks.

E. Seal insulation to re-establish integrity of the vapor barrier.

F. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar control and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.05 CONTROL SYSTEM VERIFICATION:

A. In conjunction with Control System Vendor, during the process of TAB work, manipulate control system devices as required to facilitate necessary system TAB. Provide listing of control system components and/or sequences that are not operating properly in TAB report and to Control System Vendor.

3.06 RECORD AND REPORT DATA:

A. Record data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by referenced standards, and as approved on sample report forms.

B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.07 DEMONSTRATION:

A. Training:

1. Train maintenance personnel on troubleshooting procedures and testing, adjusting,

and balancing procedures. Review with personnel the information contained in Operating and Maintenance Data.

2. Schedule training through the Owner with at least 7 days' prior notice.

END OF SECTION

The engineer of Record for Divisions 26, 27, 28 of the specifications for the Black River Tech Barracks is:

Ben Rainwater, PE, PhD

SECTION 26 0500
BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to 26, 27 and 28 Sections, in addition to the 00 General Requirements Sections.

1.2 REFERENCES

A. The following specifications and standards of issues listed below but referred to thereafter by basic designation only, form a part of these specifications:

1. National Electrical Code, 2020 Edition.
2. National Fire Protection Association's Recommended Practices.
3. Local, City and State Codes and Ordinances.
4. National Electrical Safety Code, 2012 Edition.
5. Underwriter's Laboratories, Inc.
6. Illuminating Engineering Society.
7. Institute of Electrical and Electronic Engineers.
8. Power Cable Engineers Association.
9. National Electrical Manufacturers Association.
10. American Standards Association.
11. American Society for Testing Materials.
12. Occupational Safety and Health Act.
13. Service requirements of serving utility company.
14. Americans with Disabilities Act (ADA).
15. Arkansas Energy Code (ASHRAE 90.1).
16. interNational Electrical Testing Association (NETA).

1.3 SUBMITTALS

A. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal. The basic information for each item of equipment to be included is as follows:

1. Index.

2. Installation and Operating Instructions

   a. Individual tabbed sections.

   b. Manufacturer descriptive literature.

   c. Applicable control diagrams.

   d. Composite wiring diagrams.

3. Each submittal sheet shall be clearly marked with equipment Catalog Number and accessory items being submitted.

1.4 REGULATORY REQUIREMENTS

A. Work shall conform to all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

B. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition. The Contractor, in such cases, may at his option propose any article, approved equal to or better than that specified, as approved in writing by the Engineer.

C. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

D. In case of difference between building codes, specifications, state laws, local ordinances, industry standards, and utility company regulations and the contract documents, the most stringent shall govern. The Contractor shall promptly notify the Engineer in writing of any such difference.

E. Non-Compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies.

F. All required fees, permits and inspections shall be obtained and paid for by the contractor under the section of the specifications for which they are required.

1.5 ELECTRICAL LICENSE REQUIREMENT

A. No person shall perform electrical work on the Contract without possessing an Arkansas State Master or Journeyman License from the Arkansas State Electrical Examiner's Board. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one-to-one ratio.

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

1.6 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions. The Engineer/Owner reserves the right to relocate any device a maximum distance of 6'-0" at the time of installation without an extra cost being incurred.

B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

1.7 CONTRACTOR REVISED DRAWINGS

A. The Contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job.

B. Upon completion of the work and prior to final payment, the Contractor shall furnish to the Engineer, one set of "contractor revised" reproducibles, legibly and accurately marked to indicate all changes, additions, deletions, etc., from the contract drawings.

1.8 GUARANTEE

A. The work herein specified shall be free from defects in workmanship and material under normal use and service. If, within twelve (12) months from date of substantial completion and Owner acceptance of the work herein described, any of the equipment or materials, or the installation thereof, is found to be defective in workmanship or material, it shall be replaced or repaired free of charge.

B. The Contractor shall, after completion of the original test of the installation, and acceptance by the Engineer, provide any service incidental to the proper performance of the electrical systems under guarantees outlined above for a period of one (1) year.

1.9 OPERATING AND MAINTENANCE MANUALS

A. After approval of materials and equipment for use in this project, 3 copies of an Operation and Maintenance Manual shall be submitted for approval.

B. The basic information for each item of equipment to be included is as follows:

1. Index

2. Maintenance and operating instructions

a. Manufacturer's descriptive literature and maintenance manuals

b. An Approved Set of Shop drawings

c. Applicable control diagrams

d. Composite wiring diagrams as applicable showing all motor controllers, relays, etc., with interlocking provisions as built in the job, along with a written description of the control sequence if applicable.

e. Spare parts list (when parts are provided)

f. Listing of part suppliers and their addresses

g. Single line diagram of the "as built" building electrical distribution system

h. Submit fire alarm system components inspection testing forms and system certification forms as required by NFPA 72.

C. Upon final approval, submit one (1) bound copy of the approved Operation and Maintenance Manual to the Engineer and hold two (2) copies for instruction of Owner as hereinafter specified.

1.10 COORDINATION

A. This Contractor is responsible for coordination of the requirements of these specification sections with the requirements of all Division 1-14 and Division 15 specification sections, as well as with all the other Division 16 sections. In the event there is a conflict between requirements of different sections, the most stringent of specified requirements shall take precedence and the Architect/Engineer shall be consulted.

PART 2 - PRODUCTS

2.1 UL LISTING

A. Where the Underwriter's Laboratories have an applicable standard, the product shall be listed with UL and shall be so marked.

2.2 SUBSTITUTIONS

A. Each Section of the Project Manual, when applicable, has a paragraph entitled “Manufacturers”. If “Engineer Approved Equal” is not in the list of manufacturers, no substitutions will be accepted. Submit one of the manufacturers listed.

B. The Engineer does not give any prior approvals on submittals. Do not call the Engineer for prior approval.

PART 3 - EXECUTION

3.1 600 VOLT INSULATION TEST

A. Prior to energizing the electrical system, the contractor shall provide insulation resistance tests for all distribution and utilization equipment. The Contractor shall provide a suitable and stable source of test power. The insulation test shall be a "megger" test at 500 volts D.C. for one-half minute. A test report shall be submitted to the Engineer. The minimum insulation resistance for No. 12 AWG conductors shall be 1,000,000 ohms and for larger conductors shall be 250,000 ohms. Conductors testing below the minimum insulation resistance shall be replaced and tested again.

3.2 CONTINUITY TEST

A. The Contractor shall perform a continuity test on the entire electrical system prior to

energizing the system to insure proper cable connections.

3.3 CONNECTION TORQUE TESTS

A. All No. 1/0 AWG and larger conductors with bolted connections shall be torque tested using a torque wrench. Torque shall be to National Electrical Testing Association's (NETA) Standards.

3.4 REMOVAL OF RUBBISH

A. Contractor shall remove his rubbish from building site at intervals and shall maintain the spaces allotted him in an orderly manner. On completing his work, and prior to submission of final estimate, he shall remove all tools, appliances, material and rubbish from the grounds.

3.5 FIRE ALARM SYSTEM TEST

A. The fire alarm system shall be tested by the company responsible for the installation. The fire alarm contractor shall submit a certification that the system operates properly.

3.6 GROUND RESISTANCE MEASUREMENTS

A. Ground resistance measurements of each ground rod shall be taken and certified by the Contractor to the Engineer. No part of the electrical distribution system shall be energized prior to the resistance testing of that system's ground rods and grounding system and submission of test results to the Engineer. Test reports shall indicate the location of the ground rod and grounding system and the resistance and the coil conditions at the time the test was performed. When the building water service is used as a ground of part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. The resistance to ground shall be measured using the fall-of-potential method described in IEEE No. 142.

B. Measured ground resistance shall be 5 ohms or less.

3.7 MECHANICAL OPERATION TESTS

A. All electrical equipment, such as switches, circuit breakers, etc., shall be tested by operating the device to verify that the mechanical portions of the device are functioning.

3.8 ROTATIONAL TESTS

A. The Contractor shall assist Division 15 in performing rotational tests on all motors. If rotational tests determine that conductors must be transposed to change direction of rotation, the conductors shall be changed at the make-up box on the motor; or if the change is made elsewhere, then the conductor's color coding shall be changed.

3.9 INSTRUCTING OWNER'S REPRESENTATIVE

A. The Contractor shall instruct representatives of the Owner in the proper operation and maintenance of all elements of the Electrical system.

B. Contractor shall spend not less than one (1) day in such formal instruction to fully prepare

the Owner's representative to operate and maintain the Electrical systems.

3.10 The Contractor shall bear all responsibility for any work which he performs that voids any UL listings of any equipment.

END OF SECTION

SECTION 26 05 10
ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and 00 Specification sections, apply to work specified in this section.

1.2 DESCRIPTION OF WORK

A. The extent of general building demolition work is shown on drawings. Coordinate the required electrical work with the general demolition.

B. Demolition includes removal and disposal of demolished materials, as shown on drawings and herein specified.

C. Interior demolition includes work in crawl spaces, work above ceilings, finishes, and removal and disposal of demolished materials, as shown on drawings and herein specified.

D. The Owner shall have the option of retaining any items removed. The Contractor shall dispose of all material off site, unless directed otherwise by Owner.

E. Contractor shall be required to visit the site prior to bid to familiarize himself with all existing conditions – especially those that may have an impact on Division 16 scope of work.

1.3 JOB CONDITIONS

A. Condition of Structures: The Owner assumes no responsibility for actual condition of structures to be demolished.

1. Conditions of the structure existing at time of inspection for bidding purposes will be maintained by Owner in so far as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work. The drawings are schematic and provided as an aid in bidding. The contractor shall visit the site and determine the actual conditions prior to bidding.

B. Partial Removal: Items of salvable value to Contractor may be removed from structure as work progresses. Salvaged items must be transported from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

C. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, occupied areas, and other adjacent occupied or used facilities.

D. Protections: Ensure safe passage of persons around or through area of demolition. Conduct operations to prevent injury to adjacent buildings, structures, other facilities, and persons.

1. Install temporary electrical services, lighting, etc. as required by the Owner or authorities having jurisdiction.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition operations at no cost to Owner.

F. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations. Allow no interruption in service unless coordinated with Owner at least 24 hours in advance.

1. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing fire utilities, as acceptable to governing authorities.

2. Contractor will disconnect and seal utilities serving each structure to be demolished, or interior area to be demolished, prior to start of demolition work.

G. If Contractor is required to disconnect utility services or other services to an occupied area the Contractor shall provide temporary or alternative services to that area.

PART 2- PRODUCTS

Not Applicable.

PART 3 - PRODUCTS

3.1 DEMOLITION

A. Remove all branch and feeder conduit and wire back to panelboards.

1. Where walls, ceilings, or floors are to remain, remove all devices and wire where indicated. Provide blank cover plate at outlet box or patch wall to match existing finish as directed by the issued documents and/or the Architect/Engineer.

2. All items shown to remain active shall be furnished with necessary accessible junction boxes and all conduit and wire as required to maintain circuit continuity.

3. All outlet boxes which must be removed due to demolition but which must remain active in order to maintain circuit continuity shall be relocated into ceilings or walls and shall be accessible.

4. All material fixtures and equipment to be reused shall be removed and stored on site. Before reinstallation all items are to be cleaned, tested, and prepared for re-use. Fixtures shall be re-lamped and new ballasts installed.

3.2 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Remove from site debris, rubbish, and other materials resulting from demolition operations. Pay all fees related to removal and dumping.

1. Remove and dispose of interior demolition debris only.

2. Burning of removed materials from demolished structures will not be permitted on site.

B. Removal:

1. Transport materials removed from demolished structures and dispose of offsite.

C. Store items that Owner wishes to retain as directed by the Owner.

3.3 OUTAGES

A. The Contractor shall schedule all outages with the Owner at least two weeks in advance. Owner has the right to approve or disapprove any scheduled outages. Contractor will schedule the outage at the Owner's convenience. Contractor shall pay all costs, including overtime, necessary for the outage work schedule.

B. Refrigerators and freezers shall not be turned off for more than 1 hour. If the Contractor needs more than 1 hour, he shall install a temporary feeder to the equipment and/or rent an emergency generator to power the equipment. Contractor shall pay all costs of the generator and/or temporary feeders at no additional cost to the Owner.

END OF SECTION

SECTION 26 05 19
BUILDING WIRE AND CABLE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building wire and cable.

B. Wiring connectors and connections.

1.2 RELATED SECTIONS

A. Section 26 05 33 - Conduit.

B. Section 26 05 34 - Boxes.

C. Section 26 05 53 - Identification.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. UL 83 - Thermoplastic Insulated Wires and Cables.

C. UL 486 A - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

D. UL 486 C - Splicing Wire Connectors.

E. UL 1581 - Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 16010.

B. Product Data: Provide for each cable assembly type.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for

purpose specified and shown.

1.7 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Conductors shall be copper.

C. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

D. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.8 COORDINATION

A. Determine required separation between cable and other work.

B. Determine cable routing to avoid interference with other work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - BUILDING WIRE AND CABLE

A. Triangle.

B. American.

C. Engineer Approved.

2.2 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.

B. Conductor: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: ANSI/NFPA 70, Type THW (feeder circuits) and THHN/THWN (branch circuits).

2.3 WIRING CONNECTORS

A. All cable and wire terminals, taps and splices shall be made secure with compression type connectors, approved for the service. Connections shall be installed with approved tools and dies to assure a permanent secure joint. Compression joints shall be cleaned, made smooth with insulating compound , wrapped with varnish cambric and insulated with approved electrical grade plastic tape. Where conductors are to be connected to metallic surfaces, the coated surfaces of the metal shall be polished before installing the connector. Lacquer coating of conduits shall be removed where ground clamps are

to be installed. Provide all necessary hangers, racks, cleats, and supports required to make a neat installation. Wire connectors shall conform to UL 486.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to installation verify that interior of building has been protected from weather.

B. Prior to installation verify that mechanical work likely to damage wire and cable has been completed.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Interior Locations: Use only building wire, Type THW or use THHN/THWN insulation, in raceway unless otherwise indicated on the Drawings.

B. Wet or Damp Interior Locations: Use only building wire, Type THW or THHN/THWN in raceway or liquid tight flexible conduit.

C. Exterior Locations: Use only building wire, Type THW or THHN/THWN insulation in raceway.

D. Underground Installations: Use only building wire, Type THW or THHN/THWN insulation in raceway.

E. Use wiring methods indicated on Drawings.

F. On the load-side of GFIC circuit breaker, use only Type XHHW conductors.

3.4 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.

B. Use solid conductors for feeders and branch circuits No 10 AWG and smaller, except branch circuits to motors shall be stranded copper for flexibility.

C. Use stranded conductors for control circuits 24 volts and below. Minimum size shall be No. 16 AWG.

D. Use conductors not smaller than No. 12 AWG for power and lighting circuits and 120-volt control circuits.

E. Conductors shall be continuous from outlet to outlet.

F. Use No. 10 AWG conductors for 20 amperes, 120-volt branch circuits longer than 100

feet or where the distance to the first outlet exceeds 50 feet.

G. Use No. 10 AWG conductors for 20 amperes, 277-volt branch circuits longer than 200 feet.

H. Pull all conductors into raceway at same time.

I. Use suitable wire pulling lubricant for building wire No. 4 AWG and larger.

J. Protect exposed cable from damage.

K. Support cables above accessible ceiling, using spring metal clips on cable ties to support cables from structure. Do not rest cable on ceiling panels.

L. Use suitable cable fittings and connectors.

M. Neatly train and lace wiring inside boxes, equipment, and panelboards.
N. Clean conductor surfaces before installing lugs and connectors.

O. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

P. Use sleeve compression connectors for copper conductor splices and taps, No. 6 AWG and larger. Insulated uninsulated conductors and connector with heat shrink insulation rated 600 volts.

Q. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, No. 8 AWG and smaller.

R. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, No. 10 AWG and smaller.

S. Route circuits at own discretion; however, circuit numbers shall be according to Drawings.

T. On three phase, four wire systems, do not use a common neutral for more than 3 circuits.

U, On single phase, three wire systems, do not use a common neutral for more than 2 circuits.

V. Where a common neutral is run for 2 or 3 homerun circuits, connect phase conductors to breakers in panel which are attached to separate phase legs in order that the neutral conductors will carry only the unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.

W. Run conductors of same circuit in same conduit.

X. Run conductors of different voltage system in separate conduits.

Y. Color code conductors as follows:

	480Y277 Volts	240/120 Volts
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	
Ground	Green	Green
Neutral	Gray	White

	208Y120 Volts	Switchlegs
Phase A	Black	Violet
Phase B	Red	Pink
Phase C	Blue	
Ground	Green	
Neutral	White	
Isolated Ground	Green w/ Yellow Stripe	

Provide color coding throughout the full length of all wire No. 6 and smaller. Identification by permanent paint bands or tags at the outlets will be acceptable for wire sizes larger than No. 6. Provide the same color and shade of color throughout the project.

Substitutions for Color-Coded Wire: with approval of the Engineer and the Owner's Representative, and where color coding cannot be readily provided because of limited quantities involved, either of the following shall be permitted:

a) Plastic tape applied spirally and half-lapped over exposed portions of conductors within manholes, boxes, and similar enclosures.

b) Colored tubing cut and inserted over ends of wire prior to installing terminals.

Z. Contractor shall not install more than three (3) current-carrying conductors in one conduit without derating the conductors per NEC Table 310-15(b)(2)(a).

AA. Where cables not in conduit pass through floors, cables shall be enclosed in conduit extending at least 6 inches above the floor.

BB. Cables shall be protected from physical damage where necessary by conduit.

CC. All cable splices shall be made in boxes.

DD. The radius of bends in cables shall not be less than five times the diameter of the cable.

EE. Cables shall be secured by staples, straps, j-hooks or similar fittings every 4-1/2 feet and within 12 inches of every cabinet, box and fitting.

FF. Do not pull cable sheaths back more than necessary to separate conductors.

GG. Do not score conductors when peeling back conductor insulation. Scored conductors will be replaced.

HH. Do not cut off strands from stranded conductors at terminations. Conductors with strands missing shall be replaced.

II. Kinked, torn, or twisted cable sheaths are unacceptable and shall be replaced.

JJ. Install wire and cables to avoid chemicals, cold temperature bending and different lengths of conductors of same circuit.

KK. Make sure conduits are properly terminated, reamed and brushed before installation of wire and cables.

LL. Cable sheaths shall be held in place by strain relief fittings.

MM. Verify proper conductor location at each termination before energizing.

NN. All parallel conductors shall be of the same length, type, size and shall have the same connector pressures.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Identify wire and cable under provisions of Section 16195.

B. Identify each conductor with its circuit number or other designation indicated on Drawings in each junction box and in each panelboard.

3.6 FIELD QUALITY CONTROL

A. Perform field inspection and testing.

B. Inspect wire and cable for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

D. Verify continuity of each branch circuit conductor.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

C. Bonding.

D. Chemicals.

E. Conduit.

1.2 RELATED SECTIONS

A. Section 26 05 33 - Conduit.

B. Section 26 05 19 - Building Wire and Cable.

1.3 REFERENCES

A ANSI/NFPA 70 - National Electrical Code.

B. UL 467 - Grounding and Bonding Equipment.

1.4 GROUNDING ELECTRODE SYSTEM

A. Metal underground water pipe, if any.

B. Metal frame of the building, if any.

C. Electrode.

D. Rod electrode.

E. "GEM encased in direct contact with earth.

1.5 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: No greater than 5 ohms.

1.6 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Product Data: Provide data for grounding electrodes and connections.

C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of exothermic connectors.

1.7 PROJECT RECORD DOCUMENTS

A. Submit under provisions of 26 05 00.

B. Accurately record actual locations of grounding electrodes.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum 3 years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc.

PART 2 - PRODUCTS

2.1 ROD ELECTRODE

A. Material: Copper clad steel.

B. Diameter: 3/4 inch.

C. Length: 10 feet.

2.2 WIRE

A. Material: Stranded or solid copper.

B. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

C. Wire shall conform to Section 26 05 19.

2.3 EXOTHERMIC CONNECTIONS

A. Cadweld.

A. Approved Equal.

2.4 CHEMICALS

A. Ground enhancement materials (50 lbs. minimum per rod).

B. Cadweld "GEM" system, or approved equal.

2.5 CONDUIT

A. Conduit shall conform to Section 26 05 33.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that final backfill and compaction has been completed around area where chemical ground is to be installed.

3.2 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Provide grounding of pad-mounted transformer as required by the Utility.

C. Install a grounding electrode and grounding electrode conductor at each main distribution panel and dry type transformer.

D. The grounding electrode shall consist of each of the following that are present:

1. Metal underground water pipe per NEC 250.52 (A)(1)
2. Metal frame of building or structure per NEC 250.52 (A)(2)
3. Concrete encased electrode (rebar) per NEC 250.52 (A)(3)

All grounding electrodes present shall be bonded together.

E. All of the following noncurrent-carrying metal parts of service entrance equipment are required to be effectively bonded together:

1. Raceway or support system(s) of service conductors such as conduit, cable tray, busway enclosure, cablebus framework, or other systems used for the purpose. Install bonding bushings on all metallic conduit on line side of service equipment.

2. Metal boxes, fittings, or other enclosures in the raceway support system that contains the service conductors.

3. Metallic raceway or armor used to protect a grounding electrode conductor from damage. Bonding is to be used at each end of the run, and at all intervening raceways, boxes, and enclosures between the service equipment and the grounding electrode.

F. Auger a 3 inch diameter hole to a dept of 9-1/2 feet. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Drive rod 1 foot into ground. Make Cadeweld connection. Pour chemicals around rod. Tamp around rod. Pour water in augered hole. Remove excess water from hole. Fill remainder of augered hole with soil. Tamp soil.

G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus or bushing.

H. Size and type of green equipment ground conductors and method of securing then to obtain electrical continuity and effective grounding as per National Electrical Code, Article 250. Conduit shall not be used for grounding.

I. Neutrals of lighting systems shall be grounded in accordance with the National Electrical Code.

J. All metal raceway systems, including cabinets, conduit and boxes, shall be grounded in accordance with the National Electrical Code.

K. An equipment ground conductor shall be installed in all conduits.

L. Install isolated ground conductors all the way back to the Main Distribution Panel for 240 and 208 volt services, and back to dry type transformer ground in 460 volt services.

M All unburied grounding conductors shall be installed in conduit.

3.2 FIELD QUALITY CONTROL

A. Inspect equipment grounding conductors and connections for tightness and proper installation.

B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall- of-potential method.

C. Grounding conductors shall be so installed as to permit shortest and most direct path from equipment to ground. All connections to ground conductors shall be accessible for inspections. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal-to-metal contact.

END OF SECTION

SECTION 26 05 29
SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit, cable and equipment supports.

B. Anchors and fasteners.

1.2 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

C. UL 514B - Fittings for Conduit and Outlet Boxes.

1.3 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Product Data: Provide manufacturer's catalog data for fastening systems.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: Provide adequate corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. Perforated strap iron will not be acceptable as hanger or fastening material.

D. Plastic tie wraps will not be acceptable as support materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Obtain permission from the Engineer before using powder-actuated anchors.

E. Obtain permission from the Engineer before drilling or cutting structural members.

F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

G. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide blocks between studs to support anchors.

H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

I. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

J. All conduits, both horizontal and vertical, shall be accurately supported. Each hanger shall be properly sized to fit supported pipe or conduit.

K. Where lines are supported under concrete construction, hanger rods shall be secured with concrete inserts.

L. All hangers shall be so located as to properly grade and support horizontal conduits without appreciable sagging of these lines.

M. Where multiple conduits are run horizontally at the same elevation and grade, they may be supported on trapezes of channels suspended on rods. Trapeze numbers, including suspension rods, shall be properly sized for number, size and loaded weight of conduits to be supported.

N. Conduit supports shall be installed within 3 feet of each coupling, connector and box.

O. Support 2-1/2 inch and larger conduit in accordance with Section 16880.

P. Cable supports shall be installed every 5'-0".

Q. Cable supports shall be J-hooks supported from building structure.

R. Ceiling support wires shall not be used to support cables, conduit or boxes.

S. Electrical contractor shall install his own supports for his equipment.

END OF SECTION

SECTION 26 05 33
CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rigid steel conduit.

B. Flexible metal conduit.

C. Liquid-tight flexible metal conduit.

D. Electrical metallic tubing.

E. Surface mounted raceway.

F. PVC conduit.

G. Fittings and conduit bodies.

1.02 RELATED SECTIONS

A. Section 26 05 26 - Grounding and Bonding.

B. Section 26 05 29 - Supporting Devices.

C. Section 26 05 53 - Electrical Identification.

1.03 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

B. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

D. NECA "Standard of Installation."

E. NEMA TC 3 - PVC Fittings to Use with Rigid PVC Conduit and Tubing.

F. UL 1 - Flexible Metal Conduit.

G. UL 5 - Surface Metal Raceways and Fittings

H. UL 6 - Rigid Metal Conduit.

I. UL 360 - Liquid-tight Flexible Steel Conduit.

J. UL 652 - Schedule 40 and 80 Rigid PVC Conduit.

1.04 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70.

1.05 SUBMITTALS

A. Submit under provisions of Division 1 and Section16010.

B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid-tight flexible metal conduit, metallic tubing, fittings and conduit bodies.

1.06 PROJECT RECORD DOCUMENTS

A. Accurately record actual routing of conduits larger than 2 inches.

1.07 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle Products to site.

B. Inspect all conduit for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

1.09 PROJECT CONDITIONS

A. Verify that field measurements are as shown on Drawings.

B. Verify routing and termination locations of conduit prior to rough-in.

C. Route conduit as shown on Drawings in approximate locations unless specifically dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

A. Minimum Size: 1 inch for underground installations, 3/4 inch for all other installations unless otherwise specified.

B. Underground Installations:

1. Conduit installed below grade shall be Schedule 40 PVC. All elbows shall be galvanized rigid steel conduit (RSC).

2. All conduit not installed under the floor slab shall be 24 inches below grade unless otherwise noted.

C. Outdoor Locations, Above Grade and On Roofs: Use galvanized rigid steel conduit.

D. Dry Locations:

1. Concealed: Use electric metallic tubing.

2. Exposed: Use galvanized rigid steel conduit in unfinished areas only (Electric Room, Mechanical Room) unless noted otherwise.

E. In Slabs Above Grade: Use galvanized steel only. Conduits shall not cross each other. Refer to Drawings for specific notes for conduit in slab locations.

F. Temperature Controls: Use electrical metallic tubing (EMT) conduit for line voltage and HVAC equipment control. Refer to Mechanical Sections for specific requirements.

G. All final connections to transformers, mechanical/HVAC equipment, pumps, water heaters, etc., and any equipment subject to vibration shall be in liquid-tight flexible metal conduit.

H. Minimum size of flexible metal conduit shall be 3/4” except for tap connections to luminaires, which shall be no smaller than 3/8”. Length of flexible metal conduit for luminaire tap connections shall not be less than 18” and shall not exceed 6’–0”.

2.02 RIGID STEEL CONDUIT

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Rigid Steel Conduit: ANSI 80.1

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.

2.03 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Description: Interlocked steel construction.

C. Fittings: ANSI/NEMA FB 1.

2.04 LIQUIDTIGHT METAL CONDUIT

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: ANSI/NEMA FB 1.

2.05 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied.

2. Triangle.

3. Engineer Approved.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; die-cast compression type.

2.06 SURFACE METAL RACEWAY

A. Manufacturers:

1. Wiremold.

2. Engineer Approved.

B. Description: Surface metal raceway with hidden supports.

C. Fittings Boxes and Conduit Bodies: As manufactured by surface metal raceway manufacturer.

2.07 NONMETALLIC CONDUIT

A. Manufacturers:

1. Carlon.

2. Engineer Approved.

B. Description: NEMA TC 3; Schedule 80 PVC.

C. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install surface metal raceway in accordance with manufacturer's directions.

C. Arrange supports to prevent misalignment during wiring installation.

D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers. Supports shall be installed within 3 feet of every outlet box, junction box, panel, or other tubing terminations. Fastening of unbroken lengths shall be permitted to be increased to a distance of 5 feet where structural members do not readily permit fastening within 3 feet. Do not space supports further than 10 feet apart.

E. Group related conduits; support using conduit rack. Construct rack using steel channel.

F. Fasten conduit supports to building structure and surfaces under provisions of Section 16190.

G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.

H. Do not attach conduit to ceiling support wires.

I. Arrange conduit to maintain headroom and present neat appearance.

1. Interior: All conduit in finished spaces shall be concealed unless specifically noted otherwise or unless construction prohibits.

2. Exterior: All branch circuit conduit serving exterior, building mounted light fixtures, receptacles, and other devices/equipment on finished-out exterior building walls shall be concealed unless specifically noted otherwise or unless construction prohibits.

J. Route all conduit parallel and perpendicular to walls. This includes conduit installed above ceilings, in attics, and in crawl spaces.

K. Install insulated bushings or approved equivalent on each end of all conduit.

L. Install rain-tight conduit hubs on all exterior rigid galvanized steel conduit where it enters NEMA 3R rated enclosures.

M. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Install no more than equivalent of four 90-degree bends between boxes. Use factory elbows for all 90 degree bends.

Q. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

R. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints.

S. Use suitable caps to protect installed conduit against entrance of dirt and moisture during construction.

T. Ground and bond conduit under provisions of Section 16170. Provide grounding bushings on all metallic conduit on line side of service entrance equipment and bond per code.

U. Identify conduit under provisions of Section 16195.

V. Provide suitable pull boxes in all conduit runs as required by the National Electrical Code and as required to facilitate wire installation.

W. Holes for passage of conduits through all one-hour and two-hour drywall partitions shall be neatly cut to the required size. If holes are cut larger than necessary, they shall be covered with two (2) additional pieces of 5/8 inch type X gypsum wallboard, each 8 inches by 16 inches with a half circular cutout of the proper size, one (1) layer on one-hour partitions and two (2) layers on two-hour partitions.

X. Holes for passage of conduits through one-hour, two-hour and four-hour masonry walls shall be fireproofed. Fireproofing materials shall be as follows:

1. Cellular Glass Insulation: Pittsburgh Corning Corp. Foamglas "Regular" or UL rated or UNI-JAC Ul rated pipe insulation, or approved equal.
2. Fire Retardant Putty: IPC Flamesafe Type FAS500 or FST600 Series, or improved equal, for one-hour and two-hour walls.
3. IPC/KB5 Mortar Seal, or approved equal (full depth of wall) for four-hour walls.

Y. Holes for passage of conduits through masonry floors shall be fireproofed. Fireproofing material shall be Firestop Compound - IPC Flamesafe Type 500/FST 600, or approved equal, filled to full depth of slab. Minimum annular space around conduit shall be 3/16 inch.

Z. Refer to Architectural drawings for locations of fire-rated walls, ceilings and floors.

AA. Support 2-1/2 inch and larger conduit in accordance with Section 16880.

BB. All flexible conduit in Mechanical Rooms and outside shall be liquid-tight flexible conduit.

CC. All conduits with conductors inside that enter a building wall below grade shall have a fitting equal to OZ Type CSBI installed inside conduit.

DD. Conduits which enter refrigerated areas, such as walk-in coolers and wall-in freezers, shall have a seal-off installed on the non-refrigerated side of the conduit where the conduit exits or enters the refrigerated area.

EE. Make sure conduits are properly terminated, reamed and brushed before installation of wire or cable.

FF. Install bushings on all conduits.

GG. Structural Engineer shall approve placement of conduits in all concrete slabs, beams and columns.

HH. Underground duct installation requirements:

1. Ducts shall be in accordance with the NEC, as shown on the drawings, and as specified.

2. Underground conduit stub-ups and sweeps to equipment inside of buildings shall be galvanized rigid steel, and shall extend a minimum of 5 feet outside of building foundation.

3. Stub-ups, sweeps, and risers to equipment mounted on outdoor concrete slabs shall be galvanized rigid steel, and shall extend a minimum of 5 feet away from edge of slab.

4. Install insulated grounding bushings on the terminations.

5. Rigid steel conduit turns of direction for all duct lines shall have minimum 4 feet radius in the horizontal and vertical directions. PVC conduit sweeps for all duct lines shall have a minimum 40 feet radius in the horizontal and 4 feet in the vertical directions. Where a 40 feet radius is not possible, horizontal turns of direction shall be rigid steel.

6. All multiple conduit runs shall have conduit spacers. Spacers shall securely support and maintain uniform spacing of the duct assembly a minimum of 3 inches above bottom of trench during the concrete pour. Spacer spacing shall not exceed 5 feet.

7. Duct lines shall be installed no less than 12 inches from other utility systems, such as water, sewer, and chilled water.

8. Clearances between individual ducts:
   a. For like services, not less than 3 inches.
   b. For power and signal services, not less than 6 inches.
   c. Provide plastic spacers to maintain clearances.
   d. Provide nonferrous tie wires to prevent displacement of the ducts during pouring of concrete or backfill. Tie wires shall not act as substitute for spacers.

9. Couple the ducts with proper couplings. Stagger couplings in rows and layers to insure maximum strength and rigidity of the duct bank.

10. Keep ducts clean of earth, sand, or gravel during construction, and seal with tapered plugs upon completion of each portion of the work.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance of partitions and other elements.

B. Pull boxes shall be provided at points shown on the plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction.

C. All threaded conduit shall be secured to boxes, cabinets, panels, etc. by means of a threaded bushing on the inside and lock-nutted on the box exterior and interior.

3.03 USE OF THE FOLLOWING IS PROHIBITED

A. EMT crimp-on, tap-on, indenter type fittings.

B. EMT set- screw fittings.

C. PVC inside buildings, or above grade.

D. All thread nipples in other than dry locations.

E. Wooden plugs inserted in concrete or masonry units as bases for fastening conduits, tubing, boxes, cabinets, or other equipment.

F. Installation of conduit or tubing which has been crushed or deformed.

G. LB Fittings. All bends shall be factory made 90 degree elbows.

H. Type ENT tubing.

I. Armored cable.

J. Metal-clad cable, (exception: may be used for light fixture whips).

END OF SECTION

SECTION 26 05 34
BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.

B. Floor boxes.

C. Pull and junction boxes.

1.2 RELATED SECTIONS

A. Section 26 27 26 - Wiring Devices: Floor box service fittings, access floor boxes, and mounting heights of wiring device outlets.

B. Section 26 05 35 - Equipment Wiring Systems.

1.3 REFERENCES

A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.

B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

C. ANSI/NFPA 70 - National Electrical Code.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. UL 38 - Boxes for Use with Fire-Protection Signaling Systems, Manually Actuated Signaling.

F. UL 50 - Cabinets and Boxes.

G. UL 514A - Metallic Outlet Boxes.

H. UL 514B - Fittings for Conduit and Outlet Boxes.

I. UL 996 - Electrical Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

J. UL 1241 - Junctions Boxes for Swimming Pool Lighting Fixtures.

K. UL 1773 - Termination Boxes.

L. UL 65 - Wired Cabinets.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Product Data: Provide for each cable assembly type.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.

B. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 PROJECT CONDITIONS

A. Verify field measurements are as shown on Drawings.

B. Verify locations of all outlets prior to rough-in.

C. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. The exact location of all electrical boxes shall be as approved by Engineer who reserves the right to change any outlet for a distance of 6 feet in any direction from position shown on plans, before work is roughed-in, without extra charge.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.

1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported, include 1/2 inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.

3. Receptacle, single switch, and 2 gang switch boxes for wood studs shall be Raco #194 or #235 with plaster ring of proper depth.

4. Receptacle, single switch, and 2 gang switch boxes for metal studs shall be Raco #196 or #235 with plaster ring for proper depth.

5. Gang switches of 3 or more devices for wood or metal studs and exposed work shall be Raco #950 Series, appropriate gang box and raised cover.

6. Lighting fixture outlet boxes for wood or metal studs, masonry walls, and furred ceilings shall be Raco #166, #167, or Raco #194 or #235 with plaster ring.

7. Junction boxes for wood or metal studs, masonry walls, furred ceilings and interior exposed work shall be Raco #231, #232, #233, or #235.

8. Receptacle boxes for masonry walls shall be Raco #695 or #191 with #785 device cover.

9. Switches in 6 inch and wider masonry walls shall be 3-1/2 inch deep masonry boxes of gang required. Masonry boxes in 4 inch walls shall be 2-1/2 inches deep.

10. Television outlet boxes shall be Raco #246, 4-1/16 inch box with #836 device cover ring. Telephone outlet boxes shall be Raco #256.

11.. Outlet boxes for interior exposed work shall be Raco #191, #192, #231, or #232 boxes with 1/2 inch raised, 4 inch square cover of appropriate configuration.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer.

C. Boxes shall be oversized when required by Table 370-16(a) of the National Electrical Code.

2.2 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Surface-Mounted Cast Metal Box: NEMA 250, Type as required; flat-flanged, surface-mounted junction box.

1. Material: Galvanized steel.

2. Cover: Furnish with ground flange, neoprene gasket, and stainless-steel cover screws.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

C. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

D. Install boxes to preserve fire resistance rating of partitions and other elements.

E. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

F. Use flush mounting outlet boxes in finished areas, unless noted otherwise on the Drawings.

G. Do not install flush mounting boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24-inch separation in acoustic rated walls. See Architectural floor plans for acoustic rated wall locations.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Use stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing the effectiveness.

K. Use adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires.

M. Support boxes independently of conduit.

N. Use gang box where more than one device is mounted together. Do not use sectional box.

O. In other than masonry, use 4-inch square by 1-1/2-inch minimum box with plaster ring for single devices.

P. Use cast outlet box in exterior locations exposed to the weather and wet locations.

Q. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

R. Set floor boxes level.

S. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations: Use hinged enclosure.

2. Other Locations: Use surface-mounted cast metal box.

T. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.

U. Boxes for switches shall generally be located within 6 inches of door jamb.

V. Pullboxes shall be provided at points shown on plans or required to overcome mechanical difficulties due to arrangement of runs or the fixed characteristics of the building construction. No runs of over 100 feet shall be made without use of pullbox.

W. All boxes shall have covers. All boxes installed above a ceiling and installed in unfinished spaces (Mechanical and Electrical Rooms, etc.) shall have the covers clearly and legibly marked with the circuits contained within them.

X. All flush-mounted boxes shall come within 1/4 inch of finished surface of wall.

Y. Fireproof all poke-through devices in accordance with manufacturer’s directions.

3.2 INTERFACE WITH OTHER PRODUCTS

A. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

B. Coordinate mounting heights and locations of outlets mounted above counters, branches and backsplashes with Architect prior to rough-in.

C. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.3 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closure in all unused box openings.

END OF SECTION

SECTION 26 05 35
EQUIPMENT WIRING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to plumbing, appliances, and mechanical equipment specified under other sections or Owner furnished equipment.

1.2 RELATED SECTIONS

A. Section 26 05 33 - Conduit.

B. Section 26 05 19 - Building Wire and Cable.

C. Section 26 05 34 - Boxes.

1.3 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. ANSI/NFPA 70 - National Electrical Code.

D. UL 498 - Attachment Plugs and Receptacles.

E. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 COORDINATION

A. Obtain and review shop drawings, product data, and manufacturer's instructions for equipment furnished under other sections.

B. Determine connection locations and requirements.

C. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.

D. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 - PRODUCTS

2.1 CORDS AND CAPS

A. Manufacturers:

1. Hubbell.

2. Pass & Seymour.

3. Arrow-Hart.

B. Attachment Plug Construction: Conform to NEMA WD 1.

C. Configuration: NEMA WD-6; match receptacle configuration at outlet provided for equipment.

D. Cord Construction: ANSI/NFPA 70, Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

E. Size: Suitable for connected load of equipment, length of cord, and rating at branch circuit overcurrent protection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to all mechanical equipment and any equipment subject to vibration using liquid-tight flexible conduit with watertight connectors.

C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.

D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.

E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

F. Install disconnect switches, controllers, control stations, and control devices as indicated and as required by applicable codes.

G. Provide interconnecting conduit and wiring between devices and equipment where indicated.

H. All flexible conduit to pumps, chillers, air handling units, outdoor equipment, water heaters, and any equipment subject to vibration shall be liquid-tight.

3.3 EQUIPMENT CONNECTION SCHEDULE

A. As specified on Drawings and as required to make for a completely operative system.

END OF SECTION

SECTION 260550
THROUGH-PENETRATION FIRESTOPPING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Penetrations in floor-ceiling assemblies.
2. Penetrations in roof-ceiling assemblies.
3. Penetrations in walls and partitions.
4. Penetrations in smoke barriers.
5. Construction enclosing compartmentalized areas.

1.3 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Product Certificates: Certificate of conformance signed by manufacturers of through-penetration firestop system products certifying that products comply with requirements.

1.4 QUALITY ASSURANCE

A. Provide through-penetration firestop systems that comply with the following requirements and those specified in “Performance Criteria” Article:

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop system products bear classification marking of qualified testing and inspection agency.

B. Engage an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer’s willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualifications on buyer.

C. Obtain through-penetration firestop systems for each type of penetration and construction condition indicated from a single manufacturer.

D. Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

1.6 PROJECT CONDITIONS

A. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limitations recommended by manufacturer.

B. Do not install through-penetration firestop systems when substrates are wet due to rain, frost, condensation, or other causes.

C. Do not use materials that contain flammable solvents.

D. Do not install water-based or products that are conductive when wet in contact with energized electrical conductors. Exercise care when energizing penetrants.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.

C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 PERFORMANCE CRITERIA

A. Fire Test Requirements:

1. ASTM E814, “Fire Tests of Penetration Fire Stops”.
2. ASTM E119, “Fire Tests of Building Construction and Materials”.
3. ASTM E84, “Surface Burning Characteristics of Building Materials”.
4. ASTM E1725, “Standard Test Methods for Fire Tests of Fire-Resistive Barrier Systems for Electrical System Components”.
5. UL 1479, “Fire Tests of Through Penetration Firestops”
6. UL 263, “Fire Tests of Building Construction and Materials”.
7. UL 723, “Surface Burning Characteristics of Building Materials”.

B. References:

1. Underwriters Laboratories (UL); “Fire Resistance Directory”.

    a. Through Penetration Firestop Systems (XHEZ)
    b. Fill, Void or Cavity Materials (XHHW)
    c. Firestop Devices (XHJI)
    d. Forming Materials (XHKU)

2. All major building codes:

    a. International Building Code published by ICC.

3. National Fire Protection Association (NFPA); “NFPA 101: Life Safety Code”.
4. National Fire Protection Association (NFPA); “NFPA 70: National Electrical Code”.

C. Performance Requirements:

1. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
2. Openings within walls and floors designed to accommodate cabling systems subjected to frequent cable changes shall be provided with re-enterable products specifically designed for retrofit.

2.3 MANUFACTURERS

A. Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Acceptable Manufacturer: Specified Technologies Inc., 210 Evans Way, Somerville, NJ 08876. Tel: (800) 992-1180, Fax: (908) 526-9623, Email: specseal@stifirestop.com, Website: www.stifirestop.com.
2. Substitutions: Not permitted.

B. Single Source: Obtain firestop systems for each type of penetration and construction condition indicated only from a single manufacturer.

2.4 MATERIALS

A. General: Use only through-penetration firestop system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSS Intumescent Sealant
2. Specified Technologies, Inc. (STI) SpecSeal Series LCI Intumescent Sealant
3. Specified Technologies, Inc. (STI) SpecSeal Series LC Endothermic Sealant

C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSC Firestop Collars
2. Specified Technologies, Inc. (STI) SpecSeal Series LCC Firestop Collars

D. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty

E. Firestop Putty Pads: Intumescent, non-hardening putty pads to be installed on metallic and nonmetallic electrical switch and receptacle boxes to reduce horizontal separation between boxes to less than 24”, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSP Firestop Putty Pads

F. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series RED2 Wrap Strip
2. Specified Technologies, Inc. (STI) SpecSeal Series BLU2 Wrap Strip

G. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag. Pillows shall require no modification such as cutting or shaving in order to maintain fire and leakage ratings. The following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSB Firestop Pillows

H. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series SSM Firestop Mortar

I. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag), the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal SIL300 Silicone Firestop Sealant
2. Specified Technologies, Inc. (STI) SpecSeal SIL300SL Self-Leveling Silicone Firestop Sealant

J. Composite Sheet: Intumescent material sandwiched between a galvanized steel sheet and steel wire mesh protected with aluminum foil, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal CS Composite Sheet

K. Cast-In-Place Firestop Device: Single component molded firestop device installed on forms prior to concrete placement with totally encapsulated, tamper-proof integral firestop system and smoke sealing gasket. Device shall allow for a concrete floor thickness of minimum 2-1/2 inches up to 36 inches without the use of field applied extension tubing. The following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal CID Cast-In Firestop Device

L. Firestop Plugs: Re-enterable, foam rubber plug impregnated with intumescent material for use in blank openings and cable sleeves, the following products are acceptable:

1. Specified Technologies, Inc. (STI) SpecSeal Series FP Intumescent Firestop Plug

M. Fire rated cable pathway devices shall be used in fire-rated construction for ALL low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

1. Meet the hourly fire-rating of fire rated wall and or floor penetrated.
2. Be tested for the surrounding construction and cable types involved.
3. Have UL Systems permitting cable loads from; “Zero to 100% Visual Fill.” This requirement eliminates need for fill-ratio calculations to be made by cable technicians to ensure cable load is within maximum allowed by UL System.
4. Be “Maintenance-Free”, having a corresponding Evaluation Services Report from a Nationally Recognized Third Party Laboratory. Maintenance-Free is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:
   a. Opening or closing of doors.
   b. Spinning rings to open or close fabric liner.
   c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
   d. Evaluation Services Report (ESR) from an accredited Nationally Recognized Third-party Laboratory certifying compliance with this definition of “Maintenance-Free” and all relevant codes and standards.
5. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
6. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.

7. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

N. Non-rated cable pathway devices shall be used in non-fire-rated construction for all low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Pathways required for high voltage cabling will be detailed on the prints. Such devices shall:

1. Limit the movement of smoke and sound of wall and or floor penetrated.
2. Restore the STC Rating of the penetrated assembly.
3. Provide L Ratings of greater than 1 CFM when empty and greater than 2.5 CFM at all other loading up to 100 percent.
4. Accommodate cable loads from; “Zero to 100% Visual Fill.”
5. Not have inner fabric liner that tightens around and compresses cables tightly together encouraging potential cable damage or interference.
6. Be “Maintenance-Free”, maintenance-free is defined as; No action required by cabling technician to open and/or close pathway for cable moves, adds or changes, such as, but not limited to:
   a. Opening or closing of doors.
   b. Spinning rings to open or close fabric liner.
   c. Removal and or replacement of any material such as, but not limited to, firestop caulk, putty, pillows, bags, foam muffins, foam, foam plugs, foam blocks, or foam closures of any sort.
   d. Furnish letter from manufacturer certifying compliance with this definition of “Zero-Maintenance”.
7. Pathways shall be engineered such that two or more devices may be ganged together for larger cable capacities.
8. Pathways shall be engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting and re-splicing them.
9. Affix adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed.

O. Fire-Rated Cable Grommet: Molded two-piece grommet made from plenum grade polymer with a foam inner core for sealing individual cable penetrations up to 0.27 in. (7 mm) diameter. Grommets shall be tested in single membrane or through-penetration conditions. The following products are acceptable:

1. Specified Technologies, Inc. (STI) EZ-Firestop Grommet

P. Protective Wrap: Endothermic Wrap incorporating foil scrim evaluated for protection of cable pathways, liquid fuel lines, as well as in through-penetration and membrane-penetration firestopping. Testing to incorporate protection of Electrical Metallic Tubing (EMT), Rigid Metallic Conduit (RMC), Cable Trays, single and/or multi containment liquid fuel lines. Wrap to have a maximum weight of no greater than 1.4 lbs/ft^2 and allow for the use of steel tie wire when installed around piping, conduits, and/or cable trays. The following products are acceptable:

1. Specified Technologies, Inc. (STI) E-Wrap™ Endothermic Wrap

PART 3 - EXECUTION

3.1 PREPARATION

A. Examination of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

B. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.

C. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General Requirements: Install through-penetration firestop systems in accordance with “Performance Criteria” Article and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer’s Instructions: Comply with manufacturer’s instructions for installation of through-penetration firestop systems products.

1. Seal all openings or voids made by penetrations to ensure an air and water-resistant seal.
2. Protect materials from damage on surfaces subjected to traffic.

3.3 FIELD QUALITY CONTROL

A. Inspections: Owner shall engage a qualified independent inspection agency to inspect through-penetration firestop systems.

B. Keep areas of work accessible until inspection by authorities having jurisdiction.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.4 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed openings to be free of excess through-penetration firestop system materials and soiling as work progresses.

END OF SECTION

SECTION 26 05 53
ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Nameplates and labels.

B. Wire and cable markers.

1.2 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

A. Submit under provisions of 00 Sections and Section 26 05 00.

B. Product Data: Provide catalog data for nameplates, labels, and markers.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.4 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 NAMEPLATES AND LABELS

A. Nameplates:

1. Normal Power: Engraved three-layer laminated plastic, white letters on black background.

2. Emergency Power: Engraved three-layer laminated plastic, white letters on red background.

B. Locations:

1. Each electrical distribution equipment (panelboards, transformers) and control equipment enclosure (starters, disconnect switches, etc.).

2. On each branch circuit OCP device (switch or breaker) of larger distribution type panels and switchboards.

C. Engraving requirements:

1. Line 1: Panel or equipment designation (using 3/8” letters)

2. Line 2: Voltage, Phase, Wire (using 3/8” letters)

3. Line 3: Fed From description (using 3/8” letters)

4. Sample illustrations:

MAIN 277/480V, 3P, 4W FED FROM UTILITY

PANEL HA 277/480V, 3P, 4W FED FROM MDP

PANEL LA 120/208V, 3P, 4W FED FROM TLA

TRANSFORMER TLA 480V, 3P - 120/208V, 3P, 4W FED FROM MDP

AHU-1 208V, 3P FED FROM HA

5. Engraved nameplates located adjacent to switches or circuit breakers in switchboards and/or large distribution panels may be small, single line description labels with 3/8” letters with load description only.

D. Provide typewritten directory in each panelboard of circuit designations in clear/transparent protective envelope attached to inside of panelboard door.

2.2 WIRE MARKERS

A. Description: Tape or tubing type wire markers.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.

2.3 TRENCH TAPE

A. Tape shall be detectable aluminum foil polyethylene laminate.

B. Tape shall be the following color and have the following wording:

Application	Color	Caution Wording
Cable TV	Orange	“Caution - Cable TV Line Buried Below”
Electrical	Red	“Caution - Electric Line Buried Below”
Telephone	Orange	“Caution - Telephone Line Buried Below”
Fiber Optic	Orange	“Caution - Buried Fiber Optic Cable”

C. Tape shall be equal to Panduit Type HTDU.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate and label parallel to equipment lines.

B. Secure nameplate to equipment front using No. 4 round heat cadmium plated, steel self-tapping screws or nickel-plated brass plates.

C. Identify underground conduits using underground warning tape. Install one tape per trench at 6 inches below finished grade.

D. All fire alarm junction boxes and pullboxes shall be painted red.

E. Both ends of pullwires shall be identified by means of labels or tags, reading "PULLWIRE" and shall be numbered to refer to same pullwire.

F. Install nameplates at each circuit breaker on all switchboards and large panelboards.

END OF SECTION

SECTION 16421
UTILITY SERVICE ENTRANCE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Arrangement with Utility Company for permanent electric service, including payment of Utility Company charges for service.

B. Underground service entrance.

C. Metering equipment.

1.2 RELATED SECTIONS

A. Section 26 05 33 - Conduit.

B. Section 26 05 26 - Grounding and Bonding.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

1.4 SYSTEM DESCRIPTION

A. Utility Company: Clay County Electric Cooperative Corp.

B. System Characteristics: 208Y120V, three phase, four- wire, 60 Hertz.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Utility Company written requirements.

B. Maintain one copy of each document on site.

1.6 REGULATORY REQUIREMENTS

A. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on Utility Company drawings.

PART 2 - PRODUCTS

2.1 UTILITY METERS

A. Meters will be furnished by Utility Company.

2.2 UTILITY METER BASE

A. Meter base will be furnished by Utility Company and installed by the Contractor.

2.3 TRANSFORMER PAD

A. Description: Concrete transformer pad with cable pit sized as indicated on Drawings.

2.4 GROUND GRID

A. Stranded copper conductors and copper clad steel ground rods as directed by Utility Company.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that service equipment is ready to be connected and energized.

3.2 PREPARATION

A Make arrangements with Utility Company to obtain permanent electric service to the Project.

B. Coordinate location of Utility Company's facilities to ensure proper access is available.

C. Pay all fees for electrical service to Utility Company.

3.3 INSTALLATION

A. Install service entrance conduits and conductors from Utility Company's transformer to building service entrance equipment.

B. Provide cast-in-place concrete pad and ground grid for Utility Company transformer and/or free-standing C.T. cabinet, under the provisions of Section 03300.

C. Provide buried PVC conduit from primary compartment of transformer pad to Utility Company's pole as directed by Utility Company.

D. Install meter as directed by Utility Company.

E. Provide and install secondary lugs at transformer.

END OF SECTION

SECTION 26 23 00
DISTRIBUTION SWITCHBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Main switchboard.

B. Distribution switchboard.

1.2 RELATED SECTIONS

A. Section 26 05 53 - Electrical Identification.

B. Section 26 05 80 - Utility Service Entrance

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ANSI/IEEE C12.1 - Code for Electricity Metering.

C. ANSI C39.1 - Electrical Analog Indicating Instruments.

D. ANSI C57.13 - Instrument Transformers.

E. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

F. NEMA KS 1 - Enclosed Switches.

G. NEMA PB 2 - Deadfront Distribution Switchboards.

H. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.

I. UL 891 - Dead-Front Switchboards.

J. UL 1558 - Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear.

1.4 SUBMITTALS

A. Submit under provisions of Section 16010 or as required by front end documents.

B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, [neutral,] and ground; and switchboard instrument details.

C. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components.

D. Test Reports: Indicate results of factory production tests.

E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

b. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept switchboards on site. Inspect for damage.

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 in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.9 EXTRA MATERIALS

A. Provide three of each size and type of fuse installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Eaton.

B. Square D.

2.2 SWITCHBOARD

A. Description: NEMA PB 2 with electrical ratings and configurations as indicated.

B. Main Section Devices: Individually mounted and compartmented.

C. Distribution Section Devices: Individually mounted and compartmented.

D. Auxiliary Section Devices: Individually mounted and compartmented.

E. Bus Material: Copper, standard size.

F. Bus Connections: Bolted, accessible from front for maintenance.

G. Ground Bus: Extend length of switchboard.

H. Fusible Switch Assemblies: NEMA KS 1, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R or J fuses, type as specified.

I. Fusible Switch Assemblies, 800 Amperes and Larger: Bolted pressure contact switches. Fuse clips: Designed to accommodate Class L fuses.

J. Molded Case Circuit Breakers: NEMA AB 1, integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

K. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, molded case circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole.

L. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, molded case circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 rms amperes symmetrical let-through current and energy level less than permitted for same size Class RK-5 fuse.

M. Solid-state Molded Case Circuit Breakers: NEMA AB 1, provide with electronic sensing, timing and tripping circuits for adjustable current settings; ground fault trip; instantaneous trip; and adjustable short time trip. Provide stationary mounting. Provide ground fault sensing integral with circuit breaker. Provide zero sequence type ground fault sensor.

N. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.

O. Ground Fault Sensor: Zero sequence type.

P. Ground Fault Relay: Adjustable ground fault sensitivity from 200 to 1200 amperes, time delay adjustable from 0 to 15 seconds. Provide monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

Q. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

R. Enclosure: Type 1 - General Purpose.

1. Align sections at front and rear.

2. Finish: Manufacturer's standard light gray enamel over external surfaces. Coat internal surfaces with minimum one coat corrosion-resisting paint, or plate with cadmium or zinc.

3. Mimic Bus: Show bussing, connections and devices in single line form on the front panels of the switchboard using blue color factory painting, fastened flat against the panel face with screws or rivets.

S. Interrupting Rating: Rating shall be fully rated in RMS symmetrical amperes. Series rated equipment will not be accepted.

2.3 AMMETERS AND VOLTMETERS

A. Manufacturers:

1. Eaton.

2. Square D.

B. Ammeters: ANSI C39.1; direct-reading, full range, indicating ammeter with 4.5 inch (115 mm) square recessed case and 250-degree scale, white dial with black figures and pointer, 5 ampere, 60 Hertz movement, 1 percent accuracy.

C. Voltmeters: ANSI C39.1; direct-reading, full range, indicating voltmeter with 4.5 inch (115 mm) square recessed case and 250-degree scale, white dial with black figures and pointer, 120 volt, 60 Hertz movement, 1 percent accuracy.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for switchboard installation.

3.2 PREPARATION

A. Provide concrete housekeeping pad. Concrete housekeeping pads shall extend a minimum of 6” beyond the footprint of the switchgear on all four (4) sides. Exact dimensional requirements of all pads must be checked against approved shop drawings of the switchgear.

3.3 INSTALLATION

A. Install switchboard in locations shown on Drawings, in accordance with manufacturer's written instructions and NEMA PB 2.1.

B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

C. Install fuses in each switch.

D. Install all screws and bolts in coverplates.

E. Install nameplates on each circuit breaker.

3.4 FIELD QUALITY CONTROL

A. Field inspection and] testing will be performed.

B. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

C. Measure insulation resistance of each bus section phase to phase and phase to ground for one minute each, at test voltage of 1000 volts; minimum acceptable value for insulation

resistance is 2 megohms.

D. Check tightness of accessible bolted bus joints using calibrated torque wrench.

E. Physically test key interlock systems to insure proper function.

F. Bolt switchboard to floor in accordance with Section 16880.

G. If ground fault protection system is present, it shall be field tested per the requirements of NEC 230.95(C).

3.5 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. Adjust circuit breaker trip and time delay settings to values as instructed by the Engineer.

3.6 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 26 24 00
PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Branch circuit panelboards.

B. Distribution panelboards.

1.2 RELATED SECTIONS

A. Section 26 05 29 - Supporting Devices.

B. Section 26 05 53 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

A. NECA (National Electrical Contractors Association) "Standard of Installation."

B. NEMA AB 1 - Molded Case Circuit Breakers.

C. NEMA KS 1 - Enclosed Switches.

D. NEMA PB 1 - Panelboards.

E. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

F. NFPA 70 - National Electrical Code.

G. UL 67 - Panelboards.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 RECORD DOCUMENTS

A. Record actual locations of Products; indicate actual branch circuit arrangement.

1.6 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.9 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.11 MAINTENANCE MATERIALS

A. Provide two of each panelboard key.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Square D.

B. General Electric

C. Siemens/ITE.

D. Eaton/Cutler-Hammer.

2.2 PANELBOARDS

A. Panelboards: NEMA PB1, circuit breaker type.

B. Panelboard Bus: Tin plated copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

C. Minimum integrated short circuit rating, or as indicated on the Drawings. Panelboards shall have a fully-rated interrupting rating. Series-rated equipment will not be accepted unless specifically noted otherwise on the drawings.

D. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type

SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

E. Enclosure: NEMA PB 1, Type 1.

F. Cabinet box: 6 inches deep; width: 20 inches for 240 volt and less panelboards, 20 inches for 480 volt panelboards.

G. Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

H. The use of multiple single-pole circuit breakers with wire ties or common trip plastic caps in lieu of single handle 2- and 3-pole circuit breakers is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb. Provide supports in accordance with Section 16190.

C. Height: 6 ft to top of panelboard; install panelboards taller than 6 ft with bottom no more than 4 inches above floor.

D. Provide filler plates for unused spaces in panelboards.

E. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

F. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

G. Provide a minimum of four (4) spare 20A/1P circuit breakers in each branch circuit panelboard or as indicated on the drawings.

H. Install all screws and bolts in coverplates.

I. Install knockout plugs in all unused openings in enclosure.

J. Install nameplates on all circuit breakers of large panelboards.

K. Panelboards installed on basement walls shall be installed on 1-1/2 inch channel.

L. The first section of multi-section panelboards shall have feed-through lugs. Contractor shall install conductors with ampacities equal to the bus rating of the panelbords, from the feed-through lugs to the main lugs only of Section #2 panelboard.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

END OF SECTION

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Device plates.

1.2 RELATED SECTIONS

A. Section 26 05 34 - Boxes.

1.3 REFERENCES

A. NEMA WD 1 - General Purpose Wiring Devices.

B. NEMA WD 6 - Wiring Device Configurations.

C. UL 20 - General Use Snap Switches.

D. UL 498 - Attachment Plugs and Receptacles.

E. UL 894 - Switches for Use in Hazardous (Classified) Locations.

F. UL 1010 - Receptacle Plug Combinations for Use in Hazardous (Classified) Locations.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Manufacturer's Instructions:

1. Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements.

2. Include instructions for storage, handling, protection, examination, preparation, operation and installation of product.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.6 EXTRA MATERIALS

A. Provide protective rings and split nozzles as required and as specified.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

A. Single Pole Switch:

1. Hubbell #1221.
2. Pass & Seymour #20AC1.
3. Arrow-Hart #1991.

B. Double Pole Switch:

1. Hubbell #1222.
2. Pass & Seymour #20AC2.
3. Arrow-Hart #1992.

C. Three-way Switch:

1. Hubbell #1223.
2. Pass & Seymour #20AC3.
3. Arrow-Hart #1993.

D. Four-way Switch:

1. Hubbell #1224.
2. Pass & Seymour #20AC4.
3. Arrow-Hart #1994.

2.2 RECEPTACLES (Heavy Duty, Specification Grade)

A. Single Convenience Receptacle:

1. Hubbell #5361.
2. Pass & Seymour #5361.
3. Arrow-Hart #5361.

B. Duplex Convenience Receptacle:

1. Hubbell #5362.

2. Pass & Seymour #5362.

3. Arrow-Hart #5362.

C. GFCI Receptacle:

1. Hubbell #GF5352.

2. Pass & Seymour #2091.

3. Arrow-Hart #GF5342.

D. Isolated Ground Duplex Receptacle:

1. Hubbell #IG5362.

2. Pass & Seymour #IG6300.

3. Arrow-Hart #IG5362.

E. Special Purpose Receptacle:

1. Type, NEMA configuration and voltage as specified on Drawings as manufactured by:

a. Hubbell.

b. Pass & Seymour.

c. Arrow-Hart.

F. Color of devices as selected by Architect/Engineer. All devices on emergency power shall be RED.

2.3 WALL PLATES

A. Cover Plates:

1. High impact smooth nylon in all areas except where specifically noted otherwise. Color shall be selected by the Architect. The cover plates of all devices on emergency power (receptacles, light switches, etc.) shall be RED.

2. Stainless steel in all mechanical, electrical, and equipment rooms and any unfinished spaces.

B. Weatherproof In-Use Covers/Enclosures:

1. Receptacles in wet locations shall be installed with an outlet enclosure clearly marked "Suitable for Wet Locations While in Use." There shall be a gasket between the enclosure and the mounting surface, and between the cover and the base to assure proper seal.

2. The enclosure must employ stainless steel mounting hardware and be constructed

of die cast metal with powdercoat finish. The outlet enclosure shall be UL listed, TayMac Corporation #MX3200S, or approved equal.

C. Isolated Ground Receptacle: Cover plates shall be stamped "Computer".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conditions.

B. Verify outlet boxes are installed at proper height.

C. Verify wall openings are neatly cut and will be completely covered by wall plates.

D. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

E. Verify color of all devices and coverplates.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install switches with OFF position down.

D. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

E. Install plates on switch, receptacle, and blank outlets in all areas.

F. Connect wiring devices by wrapping conductor around screw terminal.

G. Use jumbo size plates for outlets installed in masonry walls.

H. Install galvanized steel plates on outlet boxes and junction boxes above accessible ceilings, and on surface mounted outlets.

I. All plates shall be secured by means of screws with heads matching plates.

J. Receptacles shall be installed with equipment grounds down, unless local codes require otherwise. Regardless, all receptacles, including GFI receptacles, shall be installed in the same way with the ground, turned in the same direction.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 26 05 34 to obtain mounting heights specified and indicated on Drawings.

B. Install wall switch 48 inches above finished floor.

C. Install convenience receptacle 18 (vertically oriented) inches above finished floor unless noted otherwise on Drawings.

D. Install convenience receptacle 6 (horizontally oriented) inches above counter.

E. Install data and telephone outlets 18 inches above finished floor.

F. Install fire alarm audio and/or visual devices 6'-8" above finished floor, or 6 inches below finish ceiling, whichever is lower.

G. Install fire alarm pull station 4'-0" above finished floor.

3.5 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.6 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

END OF SECTION

SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.2 RELATED SECTIONS

A. Section 26 05 00 - Basic Electrical Requirements.

B. Section 26 28 16 - Enclosed Switches.

C. Section 26 29 13 - Enclosed Motor Controllers.

1.3 REFERENCES

A. NFPA 70 - National Electric Code.

B. NEMA FU 1 - Low Voltage Cartridge Fuses.

C. UL 198E - Class R Fuses.

1.4 SUBMITTALS

A. Submit under provisions of Section 26 05 00.

B. Product Data: Provide data sheets showing electrical characteristics including time-current curves.

1.5 PROJECT RECORD DOCUMENTS

A. Record actual fuse sizes.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three (3) years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.8 MAINTENANCE MATERIALS

A. Provide maintenance materials under provisions of Section 01300.

B. Provide two fuse pullers.

1.9 EXTRA MATERIALS

A. Provide three (3) of each size and type fuse installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Bussman.

B. Gould-Shawmut.

C. Little Fuse.

2.2 FUSE REQUIREMENTS

A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.

B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.

C. Other Feeder Switches Larger than 600 Amperes: Class L time delay.

D. Other Feeder Switches: Class RK1 time delay.

E. Power Branch Circuits: Class RK1, time delay.

F. Motor Branch Circuits: Class RK1, time delay.

2.3 CLASS RK1 (TIME DELAY) FUSES

A. Manufacturers:

1. Bussman.

2. Little Fuse.

3. Gould-Shawmut.

2.4. SPARE FUSE CABINET (when indicated on Drawings)

A. Description: Wall-mounted sheet metal cabinet, suitable sized to store spare fuses and fuse pullers specified.

B. Doors: Hinged with hasp for Owner's padlock.

C. Finish: Prime finish for field painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in accordance with manufacturer's instructions.

B. Install fuse with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 28 16
ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fusible switches.

B. Non-fusible switches.

C. Fuses.

1.2 REFERENCES

A. NEMA KS 1 - Enclosed Switches.

B. NFPA 70 - National Electrical Code.

C. UL 363 - Knife Switches.

D. UL 50 - Enclosures for Electrical Equipment.

E. UL 98 - Enclosed and Dead-Front Switches.

F. UL 1332 - Organic Coatings for Steel for Outdoor-Use Electrical Equipment Enclosure.

G. UL 198C - High Interrupting Capacity Fuses; Current Limiting Type.

H. UL 198E - Class R fuses.

1.3 SUBMITTALS

A. Submit under provisions of Division 1 and Section 26 05 00.

B. Product Data: Provide switch ratings and enclosure dimensions.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by UL as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Disconnect switches shall be heavy duty, as manufactured by Eaton, Square D, General Electric, or Siemens ITE.

2.2 ENCLOSED SWITCHES

A. Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch, with externally operable handle interlocked to prevent opening front cover with switch in ON position Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.

B. Non-fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Enclosures: NEMA KS 1.

1. Interior Dry Locations: Type 1.

2. Exterior Locations: Type 3R.

2.3 FUSES

A. Manufacturers:

1. Bussman.

2. Gould-Shawmut.

3. Little.

B. Description: Dual element, current limiting, time delay, one-time fuse, 600 volt, UL 198E, Class RK 1.

C. Interrupting Rating: 200,000 RMS amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated.

B. Install fuses in fusible disconnect switches.

C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.

D. Provide label on outside cover as directed by Section 26 05 53 - Electrical Identification.

E. Provide three (3) spare fuses of each type utilized.

F. Bolt switch to wall in accordance with any and all seismic requirements.

END OF SECTION

SECTION 26 29 13
ENCLOSED MOTOR CONTROLLERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Manual motor starters.

B. Magnetic motor starters.

1.2 RELATED SECTIONS

A. Section 26 05 29 - Supporting Devices.

B. Section 26 05 53 - Electrical Identification: Engraved nameplates.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

B. UL 198C - High-interrupting Capacity Fuses; Current Limiting Type.

C. UL 508 - Industrial Control Equipment.

D. NECA "Standard of Installation," published by National Electrical Contractors Association.

E. NEMA AB 1 - Molded Case Circuit Breakers.

F. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

G. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

H. NEMA KS 1 - Enclosed Switches.

1.4 SUBMITTALS

A. Submit under provisions of Section 26 05 00 and Division 1.

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protection devices, short circuit ratings, dimensions and enclosure details.

C. Test Reports: Indicate field test and inspection procedures and test results.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation and starting of Product.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NECA Standard of Installation.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters' Laboratories, Inc. as suitable for purpose specified and indicated.

1.8 EXTRA MATERIALS

A. Provide three (3) of each size and type fuse installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Square D.

B. General Electric.

C. Siemens - ITE.

D. Eaton/Cutler-Hammer.

2.2 MANUAL CONTROLLERS

A. Manual Motor Controller: NEMA ICS 2, AC general-purpose Class A manually operated, full voltage controller with overload element, red pilot light, 1 N.O. and 1 N.C. contact and pushbutton operator.

B. Fractional Horsepower Manual Controller: NEMA ICS 2, AC general-purpose Class A manually operated, full voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle switch.

C. Enclosure: NEMA ICS 6, Type 1.

2.3 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general purpose, Class A magnetic controller for induction motors rated in horsepower, full voltage, non-reversing type. Reduced voltage auto-transformer (65% tap), closed transition type for 460 volt motors

25 HP and larger, and 208/240 volt motors 15 HP and larger.

B. Two Speed Controllers: Include integral time delay transition between FAST and SLOW speeds.

C. Coil Operating Voltage: As indicated on Drawings.

D. Overload Relay: NEMA ICS; melting alloy.

E. Enclosure: NEMA ICS 6, Type 1 or 3R as indicated on Drawings.

2.4 PRODUCT OPTIONS AND FEATURES TO BE PROVIDED AS INDICATED

A. Auxiliary Contacts: NEMA ICS 2, 2 each normally open, closed, field convertible contacts in addition to seal-in contact. (Provide with all automatic controllers).

B. Cover Mounted Pilot Devices: NEMA ICS 2, standard duty type. (As applicable.)

C. Pilot Device Contacts: NEMA ICS 2, Form Z, rated A150. (As applicable.)

D. Pushbuttons: Unguarded type. (When directed by controls contractor.)

E. Indicating Lights: LED type. (Provide with all automatic controllers.)
F. Selector Switches: Rotary type (H-O-A). (Provide with all automatic controllers.)

G. Relays: NEMA ICS 2. (When directed by controls contractor.)

H. Control Power Transformers: 120 volt secondary, 100 va minimum extra capacity, in each motor starter or as scheduled. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure. (Provide with all automatic controllers.)

2.5 DISCONNECTS

A. Combination Controllers: Combine motor controllers with non-fusible switch or fusible switch, disconnect in common enclosure as scheduled.

B. Non-fusible Switch Assemblies: NEMA KS 1, enclosed knife switch with externally operable handle.

C. Fusible Switch Assemblies: NEMA KS 1, enclosed knife-switch with externally operable handle. Fuse clips: Designed to accommodate Class R fuses.

2.6 FUSES

A. Manufacturers:

1. Bussman.

2. Gould-Shawmut.

3. Little Fuse.

B. Description: Dual element, current limiting, one-time fuse, 600 volt, UL 198E, Class RK.

C. Interrupting Rating: 200,000 RMS amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Install enclosed controllers plumb. Provide supports in accordance with Section 26 05 29.

C. Height: 5 ft to operating handle.

D. Install fuses in fusible switches.

E. Select and install overload heater elements in motor controllers to match installed motor characteristics.

F. Provide and install engraved plastic nameplates under the provisions of Section 26 05 53.

G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

H. Provide and install all product options and control accessories as directed by mechanical and/or controls contractor(s).

I. Install housekeeping pad for free-standing enclosures.

3.2 FIELD QUALITY CONTROL

A. Inspect and test each enclosed controller to NEMA ICS 2.

B. Verify that each overload relay is the proper size for the motor.

C. All motor circuits shall be coordinated with the approved Division 23 shop drawings and any required changes shall be recorded on the record drawings.

END OF SECTION

SECTION 26 41 13
LIGHTNING PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Air terminals and interconnecting conductors.

B. Grounding and bonding for lightning protection.

1.2 REFERENCES

A. LPI-175 - Lightning Protection Installation Standard.

B. LPI-176 - Lightning Protection System Material and Components Standard.

C. LPI-177 - Inspection Guide for LPI Certified Systems.

D. NFPA 780 - Lightning Protection Code.

E. UL 96 - Lightning Protection Components.

F. UL 96A - Installation Requirements for Lightning Protection Systems.

1.3 SYSTEM DESCRIPTION

A. Lightning Protection System: Conductor system protecting this facility, consisting of air terminals on roofs, roof-mounted mechanical equipment, stacks, parapets, and penthouse roofs; bonding of structure and other metal objects; grounding electrodes; and interconnecting conductors.

B. This lightning protection system shall be priced and provided as a ADDITIVE ALTERNATE.

1.4 SUBMITTALS

A. Submit under requirements of Division 1 and Section 26 05 00.

B. Shop Drawings: Indicate layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.

C. Product Data: Provide dimensions and materials of each component, and include indication of listing in accordance with UL 96.

D. Submit certificate of compliance from Underwriter's Laboratories indicating approval of lightning protection systems.

1.5 REGULATORY REQUIREMENTS

A. Perform Work in accordance with NFPA 78.

B. Perform Work in accordance with UL 96A and provide Master Label.

C. Perform Work in accordance with LPI-175.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in lightning protection equipment with 5 years documented experience and member of the Lightning Protection Institute.

B. Installer: Authorized installer of manufacturer with minimum 5 years documented experience and certified by the Lightning Protection Institute.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.8 COORDINATION

A. Coordinate work with roofing and exterior and interior finish installations.

B. Before selecting copper or aluminum products, verify approved roofing material of Division 7 and that selected conductors are compatible with approved roofing materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Harger Lightning Protection, Inc.

B. A/C Lightning Security, Inc.

C. Engineer Approved.

2.2 COMPONENTS

A. Air Terminals: Copper or aluminum (as indicated on the Drawings), solid, with bases for standing seam, parapet, ridges, and single-ply roof installations.

B. Grounding Rods: 1/2 inch by 10'-0" copper clad.

C. Ground Plate: Copper.

D. Conductors: Copper or aluminum cable as required.

E. Connectors and Splicers: Bronze or aluminum as required.

F. System components shall be of copper or aluminum complying with NFPA type. Height of building structures less than 75 feet in height shall utilize Class I materials; while structures over 75 feet in height shall utilize Class II materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with NFPA 780, UL 96A, and LPI-175.

B. Connect conductors using exothermic welding process. Protect adjacent construction elements and finishes from damage.

C. Bond exterior metal bodies on building to lightning protection system.

D. Do not exceed 20 feet in spacing of 24 inch high air terminals on ridges, parapets and around perimeter of buildings with flat roofs.

E. Fasteners shall be placed on each run of exposed conductor not more than 3 feet apart. Concealed runs of conductor shall be anchored to maintain position and hold permanently in place.

F. Do not make conductor turns of less than 8 inches.

G. Roof penetrations required shall be made using through-roof assemblies with solid bars and appropriate roof flashing. Conductors shall not pass directly through the roof. Roof flashing compatible with the roofing system shall be furnished and installed by the Roofing Contractor.

H. Conductors and components for nonmetallic copper and steel roofs shall be copper and bronze. Conductors and components for aluminum roofs shall be aluminum and aluminum alloy.

I. Apply "Locktite", or approved equal, compound to threaded air terminal rod to air terminal base connection to prevent loosening from building structure/mechanical equipment vibrations.

3.2 FIELD QUALITY CONTROL

A. Obtain the services of Underwriters Laboratories, Inc. to provide inspection and labeling of the lightning protection system in accordance with UL 96A.

B. Test the grounding system to ensure continuity and that resistance to ground is not in excess of 10 ohms. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Include in the written report: locations of ground rods, resistance, and soil conditions at the time that measurements were made.

END OF SECTION

SECTION 26 51 00
INTERIOR LUMINAIRES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires and accessories.

B. Exit signs.

C. Luminaire accessories.

1.2 RELATED SECTIONS

A. Section 26 05 34 - Boxes.

B. Section 26 05 29 - Supporting Devices.

1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. ANSI/NFPA 101 - Life Safety Code.

C. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

D. UL 844 - Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.

E. UL 924 - Emergency Lighting and Power Equipment.

F. UL 8750 – Light Emitting Diode (LED) Lighting Fixtures.

1.4 SUBMITTALS

A. Submit under provisions of Section 26 05 00.

B. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.5 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of each luminaire.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 26 05 00.

B. Maintenance Data: Include replacement parts list.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Conform to requirements of NFPA 101.

C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 LUMINAIRES

A. Furnish products as specified on Drawings.

B. Install specified accessories at factory.

2.2 EXIT SIGNS

A. Manufacturers: As scheduled on Drawings.

B. Description: Exit sign fixture.

C. Housing: High impact thermplastic unless scheduled otherwise on Drawings.

D. Face: As scheduled on Drawings.

E. Directional Arrows: As indicated on Drawings.

F. Mounting: As indicated on Drawings.

G. Battery: As scheduled on Drawings.

H. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.

I. Lamps: Manufacturers standard LED lamps.

J. Input Voltage: 120/277 volts or as scheduled on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and supporting grids for luminaires.

3.2 INSTALLATION

A. Install in accordance with manufacturers instructions.

B. Support luminaires larger than 2 x 4 foot size independent of ceiling.

C. Locate recessed ceiling luminaires as indicated on Architectural reflected ceiling plan.

D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

E. Exposed Grid Ceilings: Fasten surface mounted luminaires to ceiling T bars using bolts, screws, rivets, or suitable clips.

F. Install recessed luminaires to permit removal from below. Final connections to lay-in light fixtures shall be made with 6'-0" flexible conduit.

G. Install recessed luminaires using accessories and fire-stopping materials to meet regulatory requirements for fire rating at ceiling.

H. Install clips to secure recessed grid-supported luminaires in place.

I. Install wall mounted luminaires, emergency lighting units and exit signs at height as indicated on Drawings as scheduled.

J. Install all accessories furnished with each luminaire or as required for a complete installation as indicated.

K. Connect luminaires, emergency lighting units and exit signs to outlets provided under Section 26 05 34 as indicated.

L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

M. Bond products and metal accessories to branch circuit equipment grounding conductor.

N. All fixtures shall be guaranteed for a period of one year after final acceptance and any defects in material or workmanship during this period shall be replaced or repaired to the Engineer's satisfaction without extra cost.

O. All supports, safety chains, swivels, etc. shall be furnished as required for a complete installation.

P. Securely fasten all exit signs to surface to which they are mounted.

Q. Replace all broken or cracked lens.

R. Replace all scratched or bent reflectors and door frames.

S. Light fixtures shall be supported by the T-bar system of lay-in ceilings or by supports to the building structure. Light fixtures shall not be supported by lay-in ceiling tiles.

T. Light fixtures shall not be supported from conduits, duct or piping.

U. All recessed light fixtures shall have seismic clips firmly situated over tops of ceiling grid tees or plaster rings.

V. All light fixtures that weigh more than 50 pounds shall have a safety chain or safety cable in addition to its other support.

3.3 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

B. Turn off circuit breakers serving emergency self-contained ballasts and self-contained exit signs to verify that emergency lighting is working properly.

3.4 ADJUSTING

A. Aim and adjust luminaires as indicated on Drawings or as directed.

B. Adjust exit sign directional arrows as indicated.

C. Replace LED luminaires that have failed at Substantial Completion.

3.5 CLEANING

A. Clean electrical parts to remove conductive and deleterious materials.

B. Remove dirt and debris from enclosure.

C. Clean photometric control surfaces as recommended by manufacturer.

D. Clean finishes and touch up damage.

END OF SECTION

SECTION 27 20 00
VOICE/DATA NETWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Complete computer network system, including but not limited to:

1. Conduit as specified in Section 26 05 33.
2. Boxes as specified in Section 26 05 34.
3. Grounding and bonding as specified in Section 26 05 26.
4. Terminal boards as specified in Section 27 20 00.
5. Cables.
6. Outlets.
7. Connections.
8. Patch panels.
9. Power supply as specified in Section 27 20 00.
10. Supporting devices as specified in Section 26 05 29.
11. Fire-rated pathway devices.

1.2 RELATED SECTIONS

A. Section 09900 - Painting: Field painting of backboards and cabinets.

B. Section 26 05 33 - Conduit.

C. Section 26 05 34 - Boxes.

D. Section 26 05 26 - Grounding and Bonding.

E. Section 26 05 29 - Supporting Devices: Supports for conduits and backboards.

F. Section 27 20 00 - Telephone Network System - Category 3.

1.3 SUBMITTALS

A. Submit under provisions of Division 1 and Section 16010.

1.4 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1 and Section 16010.

1.5 GENERAL

A. This Contractor shall be a full-time telecommunications contractor with at least 5 years documented experience in installing Ethernet networks. Contractor shall furnish references on at least two (2) completed Ethernet, Category 6 installations of comparable size to this project.

B. This Contractor shall furnish a compatible computer horizontal cabling network system as described in these specifications and indicated on the drawings.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Data Cables shall be four pair, UTP, Category 6, 23 AWG, plenum rated, Beldon MediaTwist 1874A.

B. Data jacks shall be Category 6, RJ-45 jacks, Panduit #CJ688 (jacket color to be selected by Owner).

C. Coverplates shall be as follows:
Panduit #CFPE1, CFPE2, or CFPE4 for 1, 2, or 4 module spaces respectively, in single gang coverplate.

Color as selected by Architect.

D. Patch panels shall be furnished and installed by the Owner.

E. Equipment racks shall be furnished and installed by the Owner.

F. Conduit for all data cables shall extend from jack location to IT equipment room.

PART 3 - EXECUTION

3.1 Provide factory bends for all elbows on conduit. Do not install more than two (2) 90 degree bends without installing a pullbox. For conduit runs longer than 100'-0", install a pullbox.

3.2 Contractor shall guarantee labor and materials for one year from date of acceptance.

3.3 No LB condulets shall be allowed.

3.4 If pull boxes are installed, they must be large enough to maintain a minimum bending radius for cables.

3.5 A complete set of "contractor revised" drawings of installation shall be provided upon completion of project.

3.6 Backboxes shall be mounted at 18 inches above the finished floor unless noted otherwise on the drawings.

3.7 Category 6 Cables shall be wired, terminated and tested to TIA/EIA Category 6 specifications.

3.8 All computer cables must be labeled at both ends with "Building No."_", Room No."_", Outlet No. "_". If room has more than one outlet, outlets shall be numbered sequentially when going around the

room clockwise from the main entrance to the room. Coordinate cabling identification with Owner's representative.

3.9 All Category 6 wiring, connectors, and jacks must be installed by contractors who are certified installers such that the completed wiring is certified for 15-year warranty for Category 6 compliance. All cabling installed shall comply with TIA/EIA Cat. 6 Standards.

3.10 All horizontal cable runs from wiring closet to outlet locations shall be routed in conduit.

3.11 Installer shall maintain the minimum distance from sources of electromagnetic interference: 6 inches from power circuits; 1 foot from fluorescent and HID lamps; and 4 feet from transformers, meters and variable frequency drives.

3.12 Each cable run shall be tested from patch panel to workstation outlets in accordance with TIA/EIA Cat. 6, transmission performance specifications for field testing of unshielded twisted-pair cabling systems, including attenuation, near end crosstalk, wire mapping, and cable length.

3.13 Submit certification of the proper operation of the computer network system.

3.14 Provide 1-year warranty of all materials and labor provided under this Section.

3.15 All raceway elbows shall be long radius elbows.

3.17 Paint terminal boards with two coats of clear varnish.

3.19 Brace all racks at top to wall and bolt to floor in accordance with Section 16880.

3.20 Cables shall be continuous, without splicing, from patch panels to outlets.

3.21 Do not peel back cable sheath more than necessary to separate conductors.

3.22 Do not score copper conductors when peeling back conductor insulation. Scored conductors shall be replaced.

3.23 Do not bend cables with a radius less than five times the cable’s diameter. Cables bent with a radius less than this shall be replaced.

3.24 Kinked, torn, or twisted cable sheaths are unacceptable and will be replaced.

3.25 Install cables to avoid water, high humidity, chemicals, cold temperature bending, pair spreading, pair wrapping, and different lengths of pairs in same cable.

3.26 Do not bundle more than 216 four-pair cables or 36 twenty-five pair cables.

3.27 Conduits shall not have 90 degree bends within 100 feet of each other.

3.28 Make sure conduits are properly terminated, reamed and brushed before installation of cable(s).

3.29 At patch panels, tie wrap cable bundles.

3.30 At patch panel terminations:

A. Push pairs down in the cable slot against the block but not against the index strips.

B. Keep pairs twisted up to termination.

C. Pull cables tight around turns.

D. Install cables in cable managers.

3.31 Do not criss-cross pairs or allow them to become interwoven.

3.32 Verify proper conductor location at each termination before energizing.

3.33 Follow color code labels.

3.34 Cable sheaths shall be held in place by strain relief fittings.

3.35 All data cables shall utilize an enclosed fire-rated pathway device wherever cables penetrate rated walls or floors. The fire-rated pathway shall contain a built-in fire sealing system sufficient to maintain hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL classified and FM Systems Approved and tested to the requirements of ASTM E814 (UL 1479).

END OF SECTION

SECTION 28 31 00
FIRE DETECTION AND ALARM SYSTEM

PART 1.0 GENERAL

1.1 RELATED SECTIONS

A. Section 13800 - Building Automation and Control.

B. Section 13900 (21 00 00) - Fire Suppression.

C. Section (27 15 00) - (Fire Alarm Communications Horizontal Cabling).

1.2 DESCRIPTION

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire detection equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.

C. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Auxiliary Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 60 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.
2. The Secondary Power Source installed in a system backed up by a generator need to supply 4 hours of backup power.

D. The fire alarm system shall be manufactured by an ISO 9001 certified company.

E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the systems integrity.

1.3 SCOPE:

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in

accordance to the project specifications and drawings.

B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC), NFPA Style 6 (Class A) or NFPA 7 (Class A) Signaling Line Circuits (SLC).
2. Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) or Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
4. All circuits shall be power-limited, UL864 9th edition requirements.
5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm when wired NFPA Style 6/7.
6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.

C. BASIC SYSTEM FUNCTIONAL OPERATION

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

a. The system alarm LED on the system display shall flash.
b. A local piezo electric signal in the control panel shall sound.
c. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
d. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm.

1.4 SUBMITTALS

A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications:

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site.

E. Certifications:

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

1.5 GUARANTY:

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.6 POST CONTRACT MAINTENANCE:

A. Maintenance and testing shall be on a semi-annual schedule or as required by the local AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
2. Each circuit in the fire alarm system shall be tested semiannually.
3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 (2002 Edition) Chapter 10.

B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

y.

1.7 POST CONTRACT EXPANSIONS:

A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules, and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.8 APPLICABLE STANDARDS AND SPECIFICATIONS:

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

B. National Fire Protection Association (NFPA) - USA:

1. No. 13 Sprinkler Systems
2. No. 70 National Electric Code (NEC)
3. No. 72 National Fire Alarm Code
4. No. 101 Life Safety Code

C. Underwriters Laboratories Inc. (UL) - USA:

1. No. 38 Manually Actuated Signaling Boxes
2. No. 50 Cabinets and Boxes
3. No. 864 Control Units for Fire Protective Signaling Systems
4. No. 268 Smoke Detectors for Fire Protective Signaling Systems
5. No. 268A Smoke Detectors for Duct Applications
6. No. 346 Waterflow Indicators for Fire Protective Signaling Systems
7. No. 464 Audible Signaling Appliances
8. No. 521 Heat Detectors for Fire Protective Signaling Systems
9. No. 1971 Visual Notification Appliances

D. Local and State Building Codes.

E. All requirements of the Authority Having Jurisdiction (AHJ).

1.9 APPROVALS:

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

1. UL Underwriters Laboratories Inc
2. ULC Underwriters Laboratories Canada
3. FM Factory Mutual
4. NYFD New York Fire Department
5. CSFM California State Fire Marshal

B. The system shall be certified for seismic applications in accordance with the International Building Code (IBC). For OSHPD applications in California the system shall be Pre-Approved for seismic applications. The basis for qualification of seismic approval shall be via shake table testing.

PART 2.0 PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

B. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.

C. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.

D. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760.
4. Wiring for 24 volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
5. Conduit shall not enter the fire alarm control panel or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4-inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire detection system. Number and size of conductors shall be as recommended by the fire detection system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits, Signaling Line Circuits and Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
5. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
6. All field wiring shall be electrically supervised for open circuit and ground fault.
7. The fire alarm control panel shall be capable of T-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., is not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets:
   1. All boxes and cabinets shall be UL listed for their use and purpose.

D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

E. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

2.3 MAIN FIRE ALARM CONTROL PANEL:

A. The FACP shall be a NOTIFIER Model NFW2-100 (FireWarden-100-2) and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

   Acceptable substitutes: EST, Simplex

B. Operator Control

   1. Acknowledge Switch:

      a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
      b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

   2. Alarm Silence Switch:

      a. Activation of the alarm silence switch shall cause all programmed alarm notification

appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.

3. Alarm Activate (Drill) Switch:

    a. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch

    a. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

5. Lamp Test:

    a. The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.

C. System Capacity and General Operation

1. The control panel shall provide, or be capable of, expansion to 198 intelligent/addressable devices.
2. The control panel shall include Form-C Alarm, Trouble and Supervisory relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include programmable Notification Appliance Circuits (NACs) capable of being wired as Class B (NFPA Style Y) or Class A (NFPA Style Z).
3. The fire alarm control panel shall include an operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
4. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes. The control unit will support the ability to upgrade its operating program using FLASH memory technology. The unit shall provide the user with the ability to program from either the included keypad, a standard PS2-style PC keyboard or from a computer running upload/download software.
5. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or REQUIRE a laptop personal computer are not considered suitable substitutes.
6. The FACP shall provide the following features:

    a. Drift compensation to extend detector accuracy during the accumulation of dust and foreign material.
    b. Detector sensitivity test, meeting requirements of NFPA 72, Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
    c. The ability to display or print system reports.
    d. Alarm verification.
    e. Positive Alarm Sequence (PAS presignal), meeting NFPA 72 (2002 Edition) 6.8.1.3

requirements
f. Rapid manual station reporting.
g. Non-alarm points for general (non-fire) control.
h. Periodic detector test, conducted automatically by the software.
i. Walk test, with a check for two detectors set to same address.

7. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.

D. Central Processing Unit

1. The microprocessor shall be a state-of-the-art; high speed device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
2. The microprocessor shall contain and execute all specific actions to be taken in the condition of an alarm. Control programming shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file.
4. A special program check function shall be provided to detect common operator errors.
5. An auto-programming capability (self-learn) shall be provided to quickly identify devices connected on the SLC and make the system operational.
6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download. This program shall also have a verification utility which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in incompliance with the NFPA 72 requirements for testing after system modification.

E. Local Keyboard Interface

1. In addition to an integral keypad, the fire alarm control panel will accept a standard PS2-style keyboard for programming, testing, and control of the system. The keyboard will be able to execute the system functions ACKNOWLEDGE, SIGNALS SILENCED, DRILL and RESET.

F. Display

1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
3. The display shall contain an alphanumeric, text-type display and dedicated LEDs for the annunciation of AC POWER, FIRE ALARM, SUPERVISORY, TROUBLE, MAINTENANCE, ALARM SILENCED, DISABLED, BATTERY, and GROUND conditions.
4. The display keypad shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. The display shall include the following operator control switches: ACKNOWLEDGE,

ALARM SILENCE, DRILL (alarm activate), and SYSTEM RESET.

G. Signaling Line Circuit (SLC)

1. The SLC interface shall provide power to and communicate with up to 99 intelligent detectors (ionization, photoelectric or thermal) and 99 intelligent modules (monitor or control) for a system capacity of 198 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
2. The CPU shall receive information from all intelligent detectors to be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically compensate for the accumulation of dust in each detector up to allowable limits. The information shall also be used for automatic detector testing and for the determination of detector maintenance conditions.
3. The detector software shall meet NFPA 72 requirements and be certified by UL as a calibrated sensitivity test instrument.

H. Serial Interfaces

1. The system shall provide a means of interfacing to UL Listed Electronic Data Processing (EDP) peripherals using the EIA-232 communications standard.
2. One EIA-232 interface shall be used to connect an UL-Listed 80-column printer. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.

I. The control panel will have the capability of Reverse Polarity Transmission or connection to a Municipal Box for compliance with applicable NFPA standards.

J. Digital Alarm Communicator Transmitter (DACT). The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The DACT shall be an integral component of the fire alarm control panel requiring no interconnecting wiring, plug-in module or supervisory circuitry.
2. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The DACT shall be completely field programmable locally from the control panel keypad or via PC software connected to the panel serial port. The DACT shall support upload/download of programming parameters from a remote location over a phone line using upload/download PC software
4. The DACT shall be capable of transmitting events in Contact ID, SIA 8 and SIA 20 formats. This ensures compatibility with existing and future transmission formats.
5. Communication shall include vital system status such as:

    a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
    b. Independent Addressable Device Status
    c. AC (Mains) Power Loss
    d. Low Battery and Earth Fault
    e. System Off Normal
    f. 12 and 24-Hour Test Signal
    g. Abnormal Test Signal (per UL requirements)
    h. EIA-485 Communications Failure
    i. Phone Line Failure

6. The DACT shall support independent zone/point reporting when used in the Contact ID format. In this format, the DACT shall support the transmission of all input addressable

points with the system. This format shall enable the central station to have exact details concerning the location of the fire for emergency response.

7. AN IP Communicator option shall be available to interface to the DACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) to a compatible receiver.

K. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
2. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.
3. The door shall provide a key lock and shall provide for the viewing of all indicators.
4. The cabinet shall accept a chassis containing the PCB and to assist in quick replacement of all the electronics including power supply shall require no more than two bolts to secure the panel to the enclosure back box.

L. Field Charging Power Supply (FCPS)

1. The FCPS-24S6/8 is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.
2. The FCPS-24S6 shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge up to 18.0 amp hour batteries and to support 60 hour standby. The FCPS-24S8 shall offer up to 8.0 amps (6.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge up to 18.0 amp hour batteries and to support 60 hour standby.
   The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (Style Y or Z) shall be available for connection to the Notification devices.
3. The Field Charging Power Supply shall include an attractive surface mount back box.
4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
5. The Field Charging Power Supply includes power limited circuitry, per UL standards.
6. The Field Charging Power Supply shall use the same key type as the fire alarm control panel and fire command center.

M. Power Supply:

1. The main power supply for the fire alarm control panel shall provide up to 6.0 amps of available power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
4. The main power supply shall continuously monitor all field wires for earth ground conditions.
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

2.4 SYSTEM COMPONENTS (not all may apply to this project – refer to Electrical Drawings):

A. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.
2. Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.
3. Shall be flush or surface mounted as shown on plans.

B. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.
2. Strobe intensity shall meet the requirements of UL 1971.
3. The flash rate shall meet the requirements of UL 1971.

C. Manual Fire Alarm Stations

1. Manual fire alarm stations shall be non-code, non-breakglass type, equipped with key lock so that they may be tested without operating the handle.
2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.
3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.
4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.

D. Conventional Photoelectric Area Smoke Detectors

1. Photoelectric smoke detectors shall be a 24 VDC, two wire, ceiling-mounted, light scattering type using an LED light source.
2. Each detector shall contain a remote LED output and a built-in test switch.
3. Detector shall be provided on a twist-lock base.
4. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash at least every 10 seconds, indicating that power is applied to the detector.
6. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.
7. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
8. All field wire connections shall be made to the base through the use of a clamping plate and screw.

E. Conventional Ionization Type Area Smoke Detectors

1. Ionization type smoke detectors shall be a two wire, 24 VDC type using a dual unipolar chamber.
2. Each detector shall contain a remote LED output and a built-in test switch.
3. Detector shall be provided on a twist-lock base.
4. It shall be possible to perform a calibration sensitivity and performance test on the detector without the need for the generation of smoke.
5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs) over 360 degrees, on the detector, which may be seen from ground level. This LED

shall flash every 10 seconds, indicating that power is applied to the detector.

6. The detector shall not alarm when exposed to air velocities of up to 1,200 feet (365.76 m) per minute. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
7. All field wire connections shall be made to the base through the use of a clamping plate and screw.

F. Duct Smoke Detectors

1. Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes.

G. Projected Beam Detectors

1. The projected beam type shall be a 4-wire 24 VDC device.
2. The detector shall be listed to UL 268 and shall consist of a separate transmitter and receiver capable of being powered separately or together.
3. The detector shall operate in either a short range (30' - 100') or long range (100' - 330') mode.
4. The temperature range of the device shall be -22 degrees F to 131 degrees F.
5. The detector shall feature a bank of four alignment LEDs on both the receiver and the transmitter that are used to ensure proper alignment of unit without special tools.
6. Beam detectors shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses.
7. The unit shall be both ceiling and wall mountable.
8. The detector shall have the ability to be tested using calibrated test filters or magnet activated remote test station.

H. OSID Detection

1. Open-area Smoke Imaging Detector shall be an available option. The OSID projected beam detector shall use UV (ultraviolet) and IR (infrared) technology to detect the presence of smoke, while providing nuisance alarm rejection.
2. The detector shall use an imager to measure the level of smoke based on the readings between the emitters and the imager, up to 7 emitters shall be supported.
3. The detector shall operate from 24 VDC
4. The detector shall be able to provide up to 80 degree wide viewing angle
5. The detector shall provide selectable alarm thresholds
6. The detector shall provide alarm and trouble relays used to activate a fire alarm control panel.

I. Aspirating Detection

1. An optional air aspiration detection system shall be available.
2. The aspirating system shall support multiple sensitivity settings.
3. The aspirating system shall operate from 24 VDC.
4. The aspirating system shall provide alarm and trouble relays used to activate a fire alarm control panel.

J. Automatic Conventional Heat Detectors

1. Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 135 degrees Fahrenheit (57.2 Celsius) for areas where ambient temperatures do not ex-

ceed 100 degrees (37.7 Celsius), and 200 degrees (93.33 Celsius) for areas where the temperature does not exceed 150 degrees (65.5 Celsius).

2. Automatic heat detectors shall be a low profile, ceiling mount type with positive indication of activation.
3. The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
4. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.
5. Automatic heat detectors shall have a smooth ceiling rating of 2500 square feet (762 square meters).

K. Waterflow Indicator:

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
3. All waterflow switches shall come from a single manufacturer and series.
4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

L. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. The switch housing shall be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

M. Specific System Operations

1. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently programmed for verification of alarm signals. The alarm verification time period shall not exceed 2 minutes.
2. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
3. Point Read: The system shall be able to display the following point status diagnostic functions:

    a. Device status
    b. Device type

c. Custom device label
d. Device zone assignments

4. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
5. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 1000 events. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety.
6. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The fire alarm control panel shall include Silent and Audible Walk Test functions - Silent and Audible. It shall include the ability to test initiating device circuits and Notification Appliance Circuits from the field without returning to the panel to reset the system. The operation shall be as follows:

    a. The Silent Walk Test will not sound NACs but will store the Walk Test information in History for later viewing.
    b. Alarming an initiating device shall activate programmed outputs, which are selected to participate in Walk Test.
    c. Introducing a trouble into the initiating device shall activate the programmed outputs.
    d. Walk Test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for Walk Test shall continue to provide fire protection and if an alarm is detected, will exit Walk Test and activate all programmed alarm functions.
    e. All devices tested in walk test shall be recorded in the history buffer.

9. Waterflow Operation

    a. An alarm from a waterflow detection device shall activate the appropriate alarm message on the control panel display; turn on all programmed Notification Appliance Circuits and shall not be affected by the Signal Silence switch.

10. Supervisory Operation

    a. An alarm from a supervisory device shall cause the appropriate indication on the control panel display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

11. Signal Silence Operation

    a. The FACP shall have the ability to program each output circuit (notification circuit or relay) to deactivate upon depression of the Signal Silence switch.

12. Non-Alarm Input Operation

    a. Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority

than fire alarm initiating devices.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General

1. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
2. Detectors shall be addressable and intelligent, and shall connect with two wires to the fire alarm control panel signaling line circuits.
3. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
   Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
4. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in (local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.
5. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.
6. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
   Detectors shall provide address-setting means using decimal switches.

B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.
3. Each detector shall contain a remote LED output and a built-in test switch.
4. Detector shall be provided on a twist-lock base.
5. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector cir-

cuits.

6. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.
7. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).
8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

D. Intelligent Multi Criteria Detector

1. The intelligent multi criteria detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.
2. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal to provide a quick response in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

E. Intelligent Ionization Smoke Detector

1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

F. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute
2. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available
3. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.

G. Intelligent Duct Smoke Detector

1. The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

H. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any normally open dry contact device) to one of the

fire alarm control panel SLCs.

2. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
5. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits.

I. Two Wire Detector Monitor Module

1. Means shall be provided for the monitoring of conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally open contact alarm initiating devices (pull stations, heat detectors, etc).
2. Each IDC of conventional devices will be monitored as a distinct address on the polling circuit by an addressable module. The module will supervise the IDC for alarms and circuit integrity (opens).
3. The monitoring module will be compatible, and listed as such, with all devices on the supervised circuit.
4. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
5. The monitoring module shall be capable of mounting in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or in a surface mount back box.
6. For multiple 2-wire smoke detector circuit monitoring a module shall be available that provides 6 Style B or 3 Style D input circuits.

J. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances
2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y.
3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.

K. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other network building functions.
2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires.

L. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment

or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

M. Serially Connected Annunciators

1. The annunciators shall communicate with the fire alarm control panel via a two wire EIA 485 (multi-drop) communications circuit.
2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits. The following operations shall also be provided:

    a. Up to 32 annunciators, each with up to 64 points may be installed on the system.
    b. The annunciator shall include a single electrical key switch to disable all switch functions.
    c. The annunciator shall provide alarm and trouble resound, with flash for new conditions.
    d. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble LEDs, and switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.
    e. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

3. This system shall provide a means of interfacing to graphic style annunciator.
4. The graphic annunciator interface will possess the capability of individually annunciating each individual addressable device in the system.
5. The system shall provide the option to interface to either ACS type annunciators or to ANN-BUS annunciator devices.
6. For ANN-BUS operation the system shall support a secondary ANN-BUS. ANN-BUS devices include the following:

    a. 80-character LCD annunciator capable of remote control of system acknowledge, silence and reset.
    b. LED annunciator capable of remote control of system acknowledge, silence and reset.
    c. LED driver module to interface to custom graphic annunciators.
    d. Printer driver module capable of supporting a serial or parallel printer.
    e. Relay module providing ten programmable relays.

N. Alphanumeric LCD Type Annunciator:

1. The alphanumeric display annunciator shall be a supervised, remotely located backlit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.

2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. An audible indication of alarm shall be integral to the alphanumeric display.
4. The display shall be UL listed for fire alarm application.
5. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.

O. Door Holders:

1. Door Holders will be available in 120 VAC and 24 VDC models.
2. 120 VAC models will be transient-protected against surges up to 600 volts.
3. Door holders will be designed for Fail Safe operation (power failure release door to close).

P. Elevator Recall:

1. Smoke detectors will be installed in the elevator hoist shaft. An alarm from such devices will signal the elevator to initiate emergency procedures. All lift call buttons; door buttons and signals will become inoperative in the lift bank serving the machine room. Lifts will immediately be sent to the main floor of egress (ground level) where they will be decommissioned until the alarm condition has been cleared or manually taken over by Fire Department personnel.
2. Smoke detectors will be installed in each elevator lobby. These detectors will function to signal the elevator to recall to the primary floor of egress (ground level) in the event of an alarm. Detectors on the first floor will signal the elevator to recall to the secondary floor of egress.

2.6 BATTERIES AND EXTERNAL CHARGER:

A. Battery:

1. The battery shall have sufficient capacity to power the fire detection system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.
2. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
3. If necessary to meet standby requirements, external battery and charger systems may be used.

PART 3.0 EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST:

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

D. Verify activation of all flow switches.

E. Open initiating device circuits and verify that the trouble signal actuates.

F. Open signaling line circuits and verify that the trouble signal actuates.

G. Open and short notification appliance circuits and verify that trouble signal actuates.

H. Ground initiating device circuits and verify response of trouble signals.

I. Ground signaling line circuits and verify response of trouble signals.

J. Ground notification appliance circuits and verify response of trouble signals.

K. Check presence and audibility of tone at all alarm notification devices.

L. Check installation, supervision, and operation of all intelligent smoke detectors during a walk test.

M. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

N. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION:

A. At the final inspection, a minimum NICET Level II technician of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION:

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

END OF SECTION