**SPECIFICATIONS**
**FOR**

# ARKANSAS NORTHEASTERN COLLEGE NEW CENTER FOR ALLIED TECHNOLOGIES BLYTHEVILLE ARKANSAS

**ARCHITECT'S PROJECT NUMBER: 074-15**


**ARCHITECT:**
**A. C. Williams, Architect**
**601 Shadow Ridge Drive**
**Jonesboro, Arkansas 72404**
**(870) 935-2852**
**License Number: 1562**

**MECHANICAL/PLUMBING:**
**BCM, Inc.**
**1015 Cordova Station**
**Cordova, Tennessee 38018**
**(901) 685-2371**

**ELECTRICAL:**
**DePouw Engineering**
**9056 South Corporate Edge Drive**
**Germantown, Tennessee 38138**
**(901) 754-2535**

**STRUCTURAL:**
**Greeson Gatlin Gangluff Associates Engineers, PA**
**100 N. Rodney Parham, Suite 4B**
**Little Rock, Arkansas 72205**
**(501) 224-7070**

**CIVIL:**
**Fisher-Arnold, Inc.**
**1801 Latourette Drive**
**Jonesboro, Arkansas 72404**
**(870) 932-2019**



COPY RIGHT 2017 BY A.C. WILLIAMS, ARCHITECT, ALL RIGHTS RESERVED
NO PART OF THIS DOCUMENT MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED, INANY FORM OR BY ANY MEANS, ELECTRONIC, MECHANICAL, PHOTOCOPYING, RECORDING, OR OTHERWISE, WITHOUT PRIOR WRITTEN PERMISSION OF THE ARCHITECT. REQUESTS FOR PERMISSION SHOULD BE ADDRESSED IN WRITING TO: A.C. WILLIAMS, ARCHITECT, 601 SHADOW RIDGE DRIVE, JONESBORO, ARKANSAS 72404

**SECTION 00000**
**PROJECT TITLE PAGE**

**SPECIFICATIONS FOR:**

1.1 ARKANSAS NORTHEASTERN COLLEGE
NEW CENTER FOR ALLIED TECHNOLOGIES
BLYTHEVILLE, ARKANSAS

**OWNER:**

2.1 ARKANSAS NORTHEASTERN COLLEGE
2105 SOUTH DIVISION
P. O. DRAWER 1109
BLYTHEVILLE, ARKANSAS 72316
PHONE: (870) 762-1020

**ARCHITECT:**

3.1 A. C. WILLIAMS, ARCHITECT (LICENSE NO. 1562)
601 SHADOW RIDGE DRIVE
JONESBORO, ARKANSAS 72404
PHONE/FAX: (870) 935-2852
EMAIL: acwilliamsarchitect@suddenlink.net

**CONSULTANTS:**

4.1 BARHAM MCCAIN MYNATT, INC. (MECHANICAL/PLUMBING)
1015 CORDOVA STATION ROAD
CORDOVA, TENNESSEE 38018
PHONE: (901) 685-2371

4.2 DEPOUW ENGINEERING (ELECTRICAL)
9056 SOUTH CORPORATE EDGE DRIVE
GERMANTOWN, TENNESSEE 38138
PHONE: (901) 754-2535

4.3 GREESON GATLIN GANGLUFF ASSOCIATES ENGINEERS, P.A. (STRUCTURAL)
100 N. RODNEY PARHAM, SUITE 4B
LITTLE ROCK, ARKANSAS 72205
PHONE: (501) 224-7070

4.4 FISHER-ARNOLD, INC. (CIVIL)
1801 LATOURETTE DRIVE
JONESBORO, ARKANSAS 72404
PHONE: (870) 932-2019

**DATE OF DRAWINGS/SPECIFICATIONS:** February 17, 2017

**ARCHITECT'S PROJECT COMMISSION NUMBER:** 074-15

**SECTION 00010**
**TABLE OF CONTENTS - ARCHITECTURAL**

**DIVISION 0 - INTRODUCTORY INFORMATION, BIDDING REQUIREMENTS, AND CONTRACT REQUIREMENTS**

00000 - PROJECT TITLE PAGE
00010 - TABLE OF CONTENT - ARCHITECTURAL
00011 - TABLE OF CONTENT - MECHANICAL AND PLUMBING
00012 - TABLE OF CONTENT - ELECTRICAL
00100 - INVITATION TO BID
00200 - SUPPLEMENT TO INSTRUCTIONS TO BIDDERS
AIA DOCUMENT A701 - INSTRUCTIONS TO BIDDERS
ARKANSAS DEPT. OF LABOR - PREVAILING WAGE RATES
STATEMENT OF INTENT TO PAY PREVAILING WAGES
00300- INFORMATION AVAILABLE TO BIDDERS
00410 - BID FORM
CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM
PERFORMANCE BOND AND PAYMENT BOND
00500 - AGREEMENT
00700 - GENERAL CONDITIONS
00800 - SUPPLEMENTARY CONDITIONS
00850 - LIST OF DRAWINGS
00860 - INTERIOR COLOR SCHEDULE

**DIVISION 1 - GENERAL REQUIREMENTS**

01100 - SUMMARY
01200 - PRICE AND PAYMENT PROCEDURES
01300 - SUBMITTALS
01325 - CONSTRUCTION PROGRESS SCHEDULE
01400 - QUALITY REQUIREMENTS
01450 - SPECIAL INSPECTIONS
01500 - TEMPORARY FACILITIES AND CONTROLS
01510 - TEMPORARY UTILITIES
01525 - FIELD OFFICES
01550 - VEHICULAR ACCESS AND PARKING
01565 - SECURITY MEASURES
01600 - PRODUCT REQUIREMENTS
01700 - EXECUTION REQUIREMENTS
01780 - CLOSEOUT SUBMITTALS

**DIVISION 2 - SITE CONSTRUCTION**

02000 - EROSION CONTROL & STORMWATER POLLUTION PREVENTION PLAN FOR CONSTRUCTION ACTIVITY
02010 - SOILS INVESTIGATION REPORT
02200 - SITE PREPARATION
02230 - SITE CLEARING
02310 - GRADING
02315 - EXCAVATION
02316 - FILL
02317 - TRENCHING
02361 - SOIL TREATMENT FOR TERMITE CONTROL
02535 - SITE SANITARY UTILITY SEWERAGE PIPING
02635 - SITE STORM UTILITY DRAINAGE PIPING

02636 - SITE WATER UTILITY DISTRIBUTION PIPING
02640 - MANHOLES AND STRUCTURES
02641 - PIPE CULVERTS
02721 - AGGREGATE BASE COURSE
02741 - ASPHALT PAVING
02751 - CONCRETE PAVING
02870 - PARKING BUMPERS
02872 - PAINTED PAVEMENT MARKINGS
02921 - SEEDING
02923 - SODDING

**DIVISION 3 - CONCRETE**
03100 - CONCRETE FORMS
03110 - CONCRETE ACCESSORIES
03200 - CONCRETE REINFORCEMENT
03300 - CAST-IN-PLACE CONCRETE
03304 - CONCRETE FINISHES
03354 - POLISHED CONCRETE

**DIVISION 4 - MASONRY**
04065 - MORTAR AND MASONRY GROUT
04080 - MASONRY REINFORCEMENT SYSTEMS
04810 - UNIT MASONRY ASSEMBLIES

**DIVISION 5 - METALS**
05100 - STRUCTURAL STEEL
05310 - STEEL ROOF DECK
05320 - METAL FLOOR DECK
05330 - COMPOSITE STEEL DECK
05400 - LIGHT GAGE METAL FRAMING
05500 - METAL FABRICATIONS
05513 - METAL ROOF HATCH LADDER
05521 - MEZZANINE GUARD RAILS / GATES
05750 - PERFORATED METAL PANELS
05810 - EXPANSION JOINT COVER ASSEMBLIES

**DIVISION 6 - WOOD AND PLASTICS**
06114 - WOOD BLOCKING AND CURBING
06200 - FINISH CARPENTRY
06410 - CUSTOM CABINETS
06650 - SOLID SURFACING

**DIVISION 7 - THERMAL AND MOISTURE PROTECTION**
07190 - WATER REPELLENTS
07212 - BOARD AND BATT INSULATION
07213 - PRE-ENGINEERED BUILDING INSULATION
07222 - ROOF BOARD INSULATION
07272 - WEATHER RESISTANT MEMBRANE FABRIC
07410 - METAL EXTERIOR WALL & SOFFIT PANELS AND INTERIOR WALL LINER PANELS
07551 - MODIFIED BITUMEN, TORCH APPLIED, MEMBRANE ROOFING SYSTEM
07610 - STANDING SEAM SHEET METAL ROOFING
07620 - SHEET METAL FLASHING AND TRIM
07711 - GUTTER AND DOWNSPOUT SYSTEM
07723 - ROOF HATCH AND LADDER SAFETY POST

07840 - FIRESTOPPING
07900 - JOINT SEALERS

**DIVISION 8 - DOORS AND WINDOWS**
08111 - STANDARD STEEL DOORS
08112 - STANDARD STEEL FRAMES
08211 - FLUSH WOOD DOORS
08330 - OVERHEAD COILING SERVICE DOORS
08341 - VERTICAL "LIFT STRAP" BI-FOLD HANGER DOOR
08360 - SECTIONAL OVERHEAD DOORS
08411 - ALUMINUM-FRAMED STOREFRONTS
08412 - ALUMINUM-FRAMED ENTRANCES
08441 - GLAZED ALUMINUM CURTAIN WALL
08452 - INSULATED TRANSLUCENT UNIT WALL SYSTEM
08710 - DOOR HARDWARE
08801 - GLASS

**DIVISION 9 - FINISHES**
09260 - GYPSUM BOARD ASSEMBLIES
09301 - PORCELAIN TILE
09302 - LARGE FORMAT PORCELAIN TILE PANELS
09511 - SUSPENDED ACOUSTICAL CEILINGS
09650 - MILLWORK RUBBER BASE AND ACCESSORIES
09680 - CARPET
09800 - SPECIAL CLEAR PROTECTIVE TREATMENT
09835 - TEXTURED MULTICOLOR AND METALLIC WALL FINISHES
09900 - PAINT AND COATINGS

**DIVISION 10 - SPECIALITIES**
10100 - VISUAL DISPLAY BOARDS
10171 - SOLID PLASTIC TOILET COMPARTMENTS
10350 - FLAGPOLES
10500 - SOLID PLASTIC LOCKERS AND METAL BENCHES
10523 - FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES
10651 - OPERABLE WALL PANELS
10800 - TOILET ACCESSORIES

**DIVISION 11 - EQUIPMENT**
11132 - PROJECTION SCREENS

**DIVISION 12 - FURNISHINGS - NOT USED**

**DIVISION 13 - SPECIAL CONSTRUCTION**
13121 - PRE-ENGINEERED BUILDINGS

**DIVISION 14 - CONVEYING SYSTEMS - NOT USED**

**END OF ARCHITECTURAL TABLE OF CONTENTS**

**SECTION 00011**
**TABLE OF CONTENTS - MECHANICAL AND PLUMBING**

**DIVISION 21 THRU 23 - MECHANICAL AND PLUMBING**

21 05 11 - COMMON WORK RESULTS FOR FIRE SUPPRESSION
21 05 48 - VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
21 10 00 - WATER BASED FIRE PROTECTION SPRINKLER SYSTEM
21 31 13 - FIRE PUMPS
22 05 00 - COMMON WORK RESULTS FOR PLUMBING
22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 07 00 - PLUMBING INSULATION
22 11 16 - DOMESTIC WATER PIPING
22 11 19 - DOMESTIC WATER PIPING SPECIALTIES
22 13 16 - SANITARY WATER AND VENT PIPING
22 13 19 - SANITARY WATER PIPING SPECIALTIES
22 15 13 - GENERAL SERVICES COMPRESSED AIR PIPING
22 34 00 - FUEL-FIRED DOMESTIC WATER HEATERS
22 40 00 - PLUMBING FIXTURES
22 61 13 - GENERAL SERVICES GAS PIPING FOR INDUSTRIAL FACILITIES
23 05 00 - COMMON WORK RESULTS FOR HVAC
23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 05 48 - SEISMIC BRACING FOR HVAC PIPING AND EQUIPMENT
23 05 93 - TESTING, ADJUSTING AND BALANCING FOR HVAC
23 07 00 - HVAC INSULATION
23 09 00 - DIGITAL CONTROL SYSTEM
23 11 23 - NATURAL GAS PIPING
23 23 00 - REFRIGERANT PIPING AND SPECIALTIES
23 31 13 - METAL DUCTS
23 33 00 - AIR DUCT ACCESSORIES
23 37 13 - DIFFUSERS, REGISTERS AND GRILLES
23 73 33 - FUEL-FIRED HEATING EQUIPMENT
23 74 13 - PACKAGED AIR CONDITIONING UNITS

**SECTION 00012**
**TABLE OF CONTENTS - ELECTRICAL**

**DIVISION 16 -ELECTRICAL**

16010 - ELECTRICAL GENERAL PROVISIONS
16050 - BASIC MATERIALS AND METHODS
16100 - ELECTRICAL OBSERVATIONS
16170 - GROUNDING AND BONDING
16190 - SEISMIC RESTRAINT SYSTEMS
16400 - SERVICE AND DISTRIBUTION
16500 - LIGHTING AND LIGHTING CONTROL
16501 - NETWORKED LIGHTING CONTROL SYSTEM
16721 - FIRE ALARM SYSTEM
16727 - SECURITY SYSTEM
16781 - VOICE/DATA ROUGH-IN CONDUIT SYSTEMS

**SECTION 00100**
**INVITATION TO BID**

**FROM:**

**1.1 THE OWNER (HEREINAFTER REFERRED TO AS OWNER):**

A. Arkansas Northeastern College, 2501 South Division, P. O. Drawer 1109, Blytheville, Arkansas 72316.

**1.2 AND THE ARCHITECT (HEREINAFTER REFERRED TO AS ARCHITECT):**

A. A. C. Williams, Architect, 601 Shadow Ridge Drive, Jonesboro, Arkansas 72404; Phone: (870) 935-2852.

**1.3 DATE:** February 17, 2017

**1.4 PROJECT NAME AND NUMBER:**

A. Arkansas Northeastern College New Center for Allied Technologies, Blytheville, Arkansas. Architect's Project Number 074-15.

**1.5 NOTICE TO CONTRACTORS:**

A. Sealed bids for a new Center for Allied Technologies building to be located on Arkansas Northeastern College - Blytheville Campus in Blytheville, Arkansas will be received at the Administration Building Conference Room at the Arkansas Northeastern College, 2501 South Division, Blytheville, Arkansas 72315, until 2:00 PM, local time, on Wednesday, March 15, 2017 and then at said location publicly opened and read aloud. Any bids not submitted on time will be returned unopened. Interested parties are invited to attend.

C. Project Description: Work includes construction of new, approximately 87,000 s.f. classroom building to serve vocational and industrial training including site work, slab on grade, pre-engineered metal building structure, metal wall panel exterior, modified bitumen and standing seam metal roofs, mechanical, plumbing, electrical and fire protection systems.

D. Architect and the Owner, unless designated to another entity, supervises the bidding and awarding of all construction contracts, approves contracts, change orders, requests for payment and provides/coordinates on-site observation of the progress of the work.

**1.6 TYPE OF BID:**

A. One proposal for the entire project.

**1.7 SUBMISSIONS OF BIDS:**

A. Bids shall be submitted on the form provided by the Architect, included herein and shall be delivered in a clearly identified, sealed, opaque envelope. See Bid Form for additional information required.

**1.8 CONSTRUCTION DOCUMENTS:**

A. Drawings and Specifications may be examined at the following locations:

1. Jonesboro Blueprint Co, Inc, 222 S. Madison, Jonesboro, Arkansas 72401, Phone: (870) 932-4349, Fax: (870) 933-7145.

2. Southern Reprographics Inc., 901 W. 7th Street, Little Rock, Arkansas 72201, Phone: (501) 372-4011, Fax: (501) 372-2902.
3. McGraw-Hill/Dodge (On-Line Electronic Subscription Service), www.construction.com
4. CMD Group (Reed Construction Data), (On-Line Electronic Subscription Service), www.cmdgroup.com

B. Sets of Drawings and Specifications may be obtained as follows:
1. Jonesboro Blueprint Co, Inc, 222 S. Madison, Jonesboro, Arkansas 72401, Phone: (870) 932-4349, Fax: (870) 933-7145.
2. Southern Reprographics Inc., 901 W. 7th Street, Little Rock, Arkansas 72201, Phone: (501) 372-4011, Fax: (501) 372-2902
3. Plan deposit checks are to be made out to A.C. Williams.
4. Cost of shipping will be in addition to the plan deposit and paid directly to either Jonesboro Blueprint or Southern Reprographics depending on where plans were printed and mailed from.

C. Prime Contractor's may obtain sets of drawings and specifications from the office of the Plan Printers listed above upon receipt of a deposit in the amount of $250.00 (Two Hundred Fifty Dollars) per set.

D. Sub-Contractors and suppliers may obtain one complete set of drawings and specifications from the office of the Plan Printers listed above upon receipt of a deposit in the amount of $250.00 (Two Hundred Fifty Dollars) per set.

E. For the mutual protections of the Owner, Contractor and Architect no partial sets of contract documents (drawings and specifications) will be issued.

F. Obtaining contract documents through any source other than the Design Professional listed above, or his representative(s) 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. The documents obtained through the Architect or his representative(s) are considered the official version and take precedence if any discrepancies occur.

**1.9 REFUND OF DEPOSITS:**

A. A full refund of deposits for up to two (2) sets of contract documents will be given to Prime Contractors who submit qualified bids on the project and return sets of contract documents, including Addendums, to the Architect's office in good, re-useable condition within ten (10) calendar days following the bid date.

B. Any contract documents over the two (2) allowed for full refund to Prime Contractors will be refunded per the paragraph below.

C. Prime Contractors who do not submit a bid, Sub-Contractors and suppliers who return sets of contract documents, including Addendums, to the Architect's office in good, re-useable condition within ten (10) calendar days following the bid date will be refunded $100.00 of their deposit.

D. Plans must be returned to the office of the Architect for refunds.

**1.10 FORFEITURE OF DEPOSITS:**

A. Plan holders who do not return the documents in good condition or who do not return the documents within the stated allowable time will forfeit the full amount of their deposit.

**1.11 BID SECURITY:**

# SECTION 00200
# SUPPLEMENT TO INSTRUCTIONS TO BIDDERS

## PART 1 - FORM OF INSTRUCTIONS TO BIDDERS

**1.1 THE INSTRUCTIONS TO BIDDERS INCLUDE AIA DOCUMENT A701 (1997 EDITION), INSTRUCTIONS TO BIDDERS WHICH FOLLOWS THIS SECTION.**

**1.2 THE INSTRUCTIONS IN THIS SECTION AMEND OR SUPPLEMENT AIA DOCUMENT A701, 1997 EDITION, INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.**

**1.3 RELATED DOCUMENTS:**

A. Document 00100 - Bid Solicitation.

B. Document 00300 - Information Available to Bidders.

C. Document 00410 - Bid Form.

D. Document 00800 - Supplementary Conditions.

## PART 2 - INVITATION

**2.1 BID SUBMISSION:**

A. Bids signed and under seal, executed, and dated will be received by the Owner in the Administration Building Conference Room of Arkansas Northeastern College located at 2501 South Division, Blytheville, Arkansas 72315 until 2:00 PM local time on the 15th day of March, 2017.

B. Bids submitted after the above time shall be returned to the bidder unopened.

C. Bids will be opened publicly immediately after the time of receipt of bids.

D. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and sealed the offer.

**2.2 INTENT:**

A. The intent of this Bid request is to obtain an offer to perform work which includes construction of new, approximately 87,000 s.f. classroom building to serve vocational and industrial training programs including site work, slab on grade, pre-engineered metal building structure, metal wall panel exterior, modified bitumen and standing seam metal roofs, mechanical, plumbing, electrical and fire protection systems located on the Campus of Arkansas Northeastern College, in Blytheville, Arkansas for a Stipulated Sum contract, in accordance with the Contract Documents.

**2.3 WORK IDENTIFIED IN THE CONTRACT DOCUMENTS:**

A. Work of this proposed Contract comprises all work described in the construction documents, including general construction work.

**2.4 CONTRACT TIME:**

A. Perform the Work within the time stated in Document 00800 - Supplemental Conditions.

B. Construction will begin Five (5) calendar days following the issuance of the Notice to Proceed and be Substantially Complete, ready for Owner occupancy not later than June 1, 2018.

C. Extensions to the Contract Time will only be considered if the requests are fully in compliance with Article 8, General Conditions of the Contract for Construction.

**2.5 PREVAILING WAGE RATES:**

A. The Contractor agrees to pay all prevailing hourly wage rates prescribed and mandated by the Arkansas Department of Labor Pursuant to Ark. Code Ann. 22-9-301 et. seq. A copy of the Arkansas Prevailing Wage Determination Number 00-335 establishing the minimum wage rates to be paid on this project is included following this section.

B. The Contractor is required to post the scale of wages in a prominent and easily accessible place at the work site. Ark. Code Ann. 22-9-309(a).

C. The General/Prime Contractor is responsible for filling out the "Statement of Intent to Pay Prevailing Wages" form that is included following this section and returning to the Arkansas Department of Labor within 30 days of the Notice to Proceed for this project.

**2.6 LIQUIDATED DAMAGES:**

A. The amount of liquidated damages shall be the sum of Five Hundred Dollars ($500.00) per calendar day following the incompletion of the project in conformance with the contract.

B. The contract time and extensions to contract time shall be as set forth under "Contract Time" above.

C. The construction must be substantially complete as described in Article 9, Subparagraph 9.8, of the General Conditions of the Contract for Construction, no later than June 1, 2018.

D. The amount of liquidated damages to be assessed shall be in accordance with the amount indicated in the Contract. Bidder understands and agrees that under the terms of the Contract to be awarded, if the Contractor fails to complete the work within the time limit specified in the Contract, the Contractor shall pay the Owner as Liquidated Damages, and not in the nature of a penalty the sum specified in the Bid Form for each day completion is delayed. It is further understood and agreed by bidder that the said sum fixed as Liquidated Damages is a reasonable sum considering the damages that Owner will sustain in the event of any delay in completion of the Work, and said amount is herein agreed upon and fixed as Liquidated Damages because of difficulty in ascertaining the exact amount of damages that may be sustained by such delay.

**PART 3 - BID DOCUMENTS AND CONTRACT DOCUMENTS**

**3.1 DEFINITIONS:**

A. Bid Documents: Contract Documents supplemented with Invitation to Bid, Instructions to Bidders, Information Available to Bidders, Bid Form Supplements to Bid Forms and Appendices identified.

B. Contract Documents: Defined in AIA A201 Article 1 including issued Addenda.

C. Bid, Offer, or Bidding: Act of submitting an offer under seal.

D. Bid Amount: Monetary sum identified by the Bidder in the Bid Form.

**3.2 CONTRACT DOCUMENTS IDENTIFICATION:**

A. Bid Documents: Contract Documents are identified as Project Number 074-15 as prepared by A. C. Williams, Architect located at 601 Shadow Ridge Drive, Jonesboro, Arkansas 72404 and identified in the Table of Contents.

**3.3 AVAILABILITY:**

A. Bid Documents may be obtained at the office of the Jonesboro Blueprint (Jonesboro, AR) or Southern Reprographics (Little Rock, AR). Complete sets of Contract Documents must be used in preparing bids: neither Owner nor Architect assume responsibility for errors or misinterpretations resulting from the use of incomplete sets of Contract Documents. Obtaining Contract Documents through any source other than those companies listed in the Invitation to Bid 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. The documents obtained through the Architect or his representative(s) are considered the official version and take precedence if any discrepancies occur. 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.

B. Sets of Bid Documents can be obtained by Bidders upon receipt of a deposit by certified check or cash in the amount stipulated in the Bid Solicitation.

C. Refund of Bid Documents Deposits will be made per the Bid Solicitation.

D. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not grant a license for other purposes.

E. No partial sets of documents will be issued.

**3.4 COPYRIGHT AND ELECTRONIC FILES:**

A. All parties are hereby notified that no portion of the documents may be reproduced under penalty of copyright law. All parties are also notified that no electronic files of this project will be made available for bidding purposes nor for use during the construction phase. Inquires concerning electronic files are to be addressed to the Architect.

**3.5 EXAMINATION OF DRAWINGS, SPECIFICATIONS AND SITE OF WORK:**

A. Bid Documents are available for examination at the offices of the various construction association plan room facilities as listed in the Bid Solicitation.

B. Upon receipt of Bid Documents verify that documents are complete. Notify Architect should the documents be incomplete.

C. Immediately notify Architect upon finding discrepancies or omissions in the Bid Documents

D. Bidders shall examine the Contract Documents and visit the project site or work. 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. No allowance will be made to Bidder because of lack of such examination or knowledge. The submission of a Bid shall be construed as conclusive evidence that the Bidder has made such examination.

**3.6 INQUIRIES/ADDENDA:**

A. Address all communications regarding the Contract Documents to A.C. Williams, Architect, 601 Shadow Ridge Drive, Jonesboro, Arkansas 72404. Phone (870) 935-2852.

B. Addenda may be issued during the bidding period. All Addenda become part of the Contract Documents. Include resultant costs in the Bid Amount.

C. Verbal answers are not binding on any party.

D. Clarifications requested by Bidders must be in writing not less than 7 days before date set for receipt of Bids. The reply will be in the form of an Addendum, a copy of which will be mailed, faxed, e-mailed or delivered to known recipients of Bid Documents. Only bidders who have obtained contract documents from authorized sources and are listed on the bid list will receive Addendums.

**3.7 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS:**

A. Where the Bid Documents stipulate a particular product, substitutions will be considered by the Architect up to 10 days before receipt of bid.

B. The submission shall provide sufficient information to determine acceptability of such products.

C. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.

D. In submission of substitutions to products specified, bidders shall include in their bid, any changes required in the Work and changes to Contact Time and Contract Sum to accommodate such substitutions. A later claim by the bidder for an addition to the Contract Time or Contract Sum because of changes in work necessitated by use of substitutions shall not be considered.

E. Provide complete information on required revisions to other Work to accommodate each substitution, the value of additions to or reductions from the Bid Amount, including revisions to other Work.

F. Provide products as specified unless substitutions are submitted in this manner and subsequently accepted.

**PART 4 - SITE ASSESSMENT**

**4.1 SITE EXAMINATION:**

A. All bidders are encouraged to examine the project site before submitting a bid. Bidders shall satisfy themselves with the character, quality and quantities of work to be performed, material to be furnished, and as to the requirements of the contract documents. The submission of a proposal shall be "prima facie" evidence that the Bidder has made such examination.

**PART 5 - BIDDER QUALIFICATIONS**

**5.1 EVIDENCE OF QUALIFICATIONS:**

A. ALL CONTRACTORS MUST BE LICENSED ON THE DAY OF THE BID SUBMITTAL.

B. To demonstrate qualification for performing the Work of this Contract, bidders may be requested to submit written evidence of financial position, previous experience, and current commitments,

license to perform work in the State.

C. Bidders are presumed to be familiar with all federal, state, county, and city laws, ordinances, and regulations which affect those persons engaged in such work, materials, or equipment used, and other conditions affecting the work. Bidders shall comply with all such laws, ordinances, and regulations. Bidders shall comply with the requirements of the General Contractor's Licensing Law of the State of Arkansas, Act 150, of the Acts of 1965, as amended.

**5.2 SUBCONTRACTORS/SUPPLIERS/OTHERS:**

A. SUBCONTRACTORS: All prime Contractors, as a condition to perform construction work for and in the State of Arkansas, shall use no other subcontractors when the subcontractors' portion of the project is $20,000 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC-R), Plumbing, Electrical and Roofing. Refer to Paragraph 6.01C this section for full requirements and bid submission requirements.

B. Arkansas Code Mn. 22-9-404 requires listed subcontractors (mechanical, plumbing, electrical and roofing/sheetmetal) whose bid to the general contractor exceeds $50,000.00 to provide a 100% Performance and Payment Bond to the general contractor if required by the general contractor.

C. Owner reserves the right to reject a proposed subcontractor for reasonable cause.

D. Refer to AIA A201, Article 5 of General Conditions.

**5.3 ELECTRICAL LICENSE REQUIREMENT:**

A. No person shall perform electrical work on the contract without possessing an Arkansas Master or Journeyman License from the Arkansas State Electrical Examiners Board.

B. All electrical work and apprentice electricians shall be supervised by a Master or Journeyman Electrician on a one to one ratio.

C. All electricians shall have a copy of their license with them at all times while on the project premises and shall be required to produce it upon request.

D. Pursuant to Ark. Code Ann. 22-9-404, the Bidder may require subcontractors (mechanical, plumbing, electrical and roofing/sheet metal) whose bid to the Contractor exceeds $50,000.00 to provide a Performance and Payment Bond to the Bidder.

**5.4 MINORITY PARTICIPATION:**

A. Pursuant to Arkansas Code Annotated 22-9-203, the State encourages all small, minority and women business enterprises to submit bids for capital improvements. Encouragement is also made to all general contractors that in the event they subcontract portions of their work, consideration is given to the identified groups.

**PART 6 - BID SUBMISSION**

**6.1 SUBMISSION PROCEDURE:**

A. Bidders shall be solely responsible for the delivery of their bids in the manner and time prescribed.

B. Submit bids on the Bid Form in an opaque, sealed envelope. Identify the envelope with:
1. Project Name and number.
2. Bid Package number (if applicable)

3. Name and Address of Bidder.
4. Arkansas Contractor's License number; only one bid shall be submitted per State Contractor's license number.
5. Owner's Name.

Submit bids in accordance with the Invitation to Bid. All blanks on the form shall be filled out in ink or be typewritten. Erroneous entries, alterations, and erasures shall be lined out, initialed by the Bidder, and the corrected entry inserted on the Bid Form.

C. Act 1250 of 1999 and Act 1496 of 1999 of the State of Arkansas, which amend Arkansas Code Annotated 1987, 22-9-204, requires all Prime Contractors, as a condition to perform construction work for and in the State of Arkansas, to use no other subcontractors when the subcontractor's portion of the project is $20,000 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC-R), Plumbing, Electrical and Roofing. For those bids where the listed work is $20,000 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 indicated on the space provided on the Form of Proposal the amount of the listed work is $20,000 or more. The Prime Contractor may use his own forces to do the listed work, however if the listed work is $20,000 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 $20,000 or more. In the event the amount of the listed work is below $20,000, the Prime Contractor shall place the names of the person or firm performing the work and indicate on the space provide on the Form of Proposal the listed is under $20,000. Failure to fill the form correctly shall cause the bid to be declared non-responsive and the bid will not receive consideration. 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, the Owner, and the Construction Section of Arkansas State Building Services. It shall be mandatory that any subcontractor listed in (A) - (D) on the Form of Proposal by the Prime Contractor be awarded a contract under Arkansas code Annotated 22-9-204. Prime Contractors who submit a bid listing unlicensed contractors or use unlicensed contractors on a state project or any subcontractor not licensed by the Contractors Licensing Board who perform work on a state project are subject to civil penalty, after notice and hearing, of not less than $250.00 or more than $500.00 and may be suspended from bidding on state projects.

D. 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, by telegraph, or by facsimile at any time prior to expiration of the bidding time and date and shall so work the modification(s) as to not reveal the amount of the original bid. Telegraph or facsimile modifications shall require written confirmation over the Bidder's signature within 24 hours after bid opening.

E. Where a fire alarm system is present, it shall be installed by a licensed alarm system contractor in compliance with the Alarm System Licensing Act 1004 of 1985 of the State of Arkansas.

F. Improperly completed information, irregularities in security deposit, shall be cause not to open the Bid Form envelope and declare the bid invalid or informal.

**6.2 BID INELIGIBILITY:**

A. Bids that are incomplete, unsigned, improperly signed or sealed, conditional, illegible, obscure, contain arithmetical errors, erasures, alterations, or irregularities of any kind, may at the discretion of the Owner, be declared unacceptable.

B. All spaces provided on Bid Forms for a bidder response must be filled out. Do not leave any item blank. Should a space on bid form not apply to this specific project bid insert "N/A" in the space provided. Leaving any spaces for a bidder response on bid form blank will cause entire bid to be declared invalid.

C. Failure to provide security deposit, bonding or insurance requirements will invalidate the bid.

D. 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.

**PART 7 - BID ENCLOSURES/REQUIREMENTS**

**7.1 SECURITY DEPOSIT:**

A. Bids shall be accompanied by a security deposit as follows:
1. "Each bid proposal shall include with it a bid security in the amount of 5% of the total bid offered, if the bid is in excess of $20,000.00. 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 on a bank or trust company doing business in Arkansas or by a corporate bid bond in an amount equal to 5% of the bid. The bidder shall include in the bid the bid bond amount so that the bond represents the total cost to the Owner of all work included in the contract.
2. The bond shall indemnify the Owner against failure of the Contractor to execute and deliver the contract and necessary bond (Performance and Payment Bond) for faithful performance of the contract. The bid bond shall provide that the contractor or surety must pay the damage, loss, cost and expense subject to the amount of the bid security directly arising out of the Contractor's default in failing to execute and deliver the contract and bonds.

B. Owner will have the right to retain the bid security of bidders to whom an award is being considered until the Contract has been executed and bonds if required, have been furnished, or until specified time has elapsed so that bids may be withdrawn, or all bids have been rejected.

C. The security deposit will be returned after delivery to the Owner of a signed contract and the required Performance and Payment Bond(s) by the accepted Bidder.

D. After a bid has been accepted, all securities will be returned as soon as possible to the respective Bidders.

E. The Owner reserves the right to retain the security of the next two lowest bidders until a contract is signed or until 30 days after bid opening. All other security will be returned as soon as possible to the respective Bidders.

F. Failure to execute the Contract and file an acceptable full Payment of Performance bond and proof of liability insurance within ten (10) working days after the Intent to Award has been issued to the bidder shall be just cause for the cancellation of the award and forfeiture of the bid bond, which shall become the property of the agency, not as a penalty but in liquidated damages sustained. Award may then be made to the next lowest responsible bidder, or the work may be rebid and constructed under contract or otherwise as the State determines. The low bidder who fails to execute the Contract and submit an acceptable Payment and Performance bond and proof of liability insurance will not be permitted to bid on any subsequent advertisement of that project.

G. If no contract is awarded all security deposits will be returned.

**7.2 PERFORMANCE ASSURANCE:**

A. Accepted Bidder: Provide a Performance and Payment bond in an amount equal to one hundred percent (100%) of the amount of the contract as described in Section 00800 - Supplementary Conditions.

B. Performance and Payment Bonds are not required for bids $20,000.00 or under, except for re-roofing projects. For work exceeding $20,000.00, the bidder shall furnish a Performance and Payment bond in the amount equal to 100 percent of the contract price, on a form identical to the Arkansas Statutory Performance and Payment Bond Form included with the Contract Documents as security for faithful performance of the Contract and payment of all obligations arising thereunder within ten days after receipt of the Intent to Award. The bond shall be written by a surety company qualified and authorized to do business in the State of Arkansas. The bond shall be executed by a resident local agent licensed by the State Insurance commissioner, to represent the surety company. The bond shall be written in favor of the Owner. Bidder shall file the bond with the Circuit Clerk in the county where the Work is to be performed. Failure to deliver said bonds, as specified, shall be considered as having abandoned the Contract and the bid security will be retained as liquidated damages. The bidder shall include in the bid the Performance and Payment Bond amount so that the bid represents the total cost to the Owner of all work included in the contract.

C. Time of delivery and form of bonds subparagraph 7.2.1, AIA Document A701, 1997 Edition, Instructions to Bidders is omitted in its entirety. Subparagraph 7.2.2 is modified as follows: "Only the Arkansas Statutory Performance and Payment Bond shall be used."

D. The successful Bidder will be required to execute an Agreement with the Owner on a form identical to the Agreement From included with the Contract Documents and the Performance and Payment Bond and Certification of Insurance within ten 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.

**7.3 INSURANCE:**

A. Provide an executed "Undertaking of Insurance" on a standard form provided by the insurance company stating their intention to provide insurance to the Bidder in accordance with the insurance requirements of the Contract Documents.

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 then days after receipt of the Intent of 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.

**7.4 PREVAILING WAGE RATES:**

A. Arkansas Department of Labor Prevailing Wage Rates will apply to this project.

B. The Contractor agrees to pay all prevailing hourly wage rates prescribed and mandated by the Arkansas Department of Labor Pursuant to Ark. Code Ann. 22-9-301 et seq. Refer to Prevailing Wage Rate Determination included as a part of these specifications.

**7.5 DISCRIMINATION PARAGRAPH:**

A. In the event that a contract is entered into pursuant to the Bid Solicitation, the Bidder shall not discriminate against any qualified employee or qualified applicant for employment because of race,

color, creed, national origin, or ancestry. The Bidder must include in any and all subcontracts a provision similar to the one above.

**7.6 GOVERNING LAWS AND REGULATIONS:**

A. Bidder is advised that taxes, laws, municipal ordinances and regulations of authorities having jurisdiction over construction of the project shall apply to the Contract. The Contractor shall pay all taxes, fees, licenses and permits for this project. Act 37 of 1992 which provide a procedure for collection of use taxes from contractors.

**7.7 BID FORM SIGNATURE:**

A. The Bid Form shall be signed by the bidders as follows:
   1. Bids shall be signed with the name typed below the signature.
   2. Sole Proprietorship: Signature of Sole Proprietor in the presence of a witness who will also sign. Insert the works "Sole Proprietor" under the signature. Affix seal.
   3. Partnership: Signature of all partners in the presence of a witness who will also sign. Insert the word "Partner" under each signature. Affix seal to each signature.
   4. Corporation: Signature of a duly authorized signing officer(s) in their normal signatures. Insert the officer's capacity in which the signing officer acts, under each signature. Affix the corporate seal. If the bid is signed by officials other than the president and secretary of the company, or the president/secretary/treasurer of the company, a copy of the by-law resolution of their board of directors authorizing them to do so, must also be submitted with the Bid Form in the bid envelope. Bids shall be signed with the legal names of the corporation followed by the name of the State of Incorporation, contractor's license number issued by the Contractors Licensing Board, and the signature of an authorized officer of the corporation.
   5. Joint Venture: Each party of the joint venture shall execute the Bid Form under their respective seals in a manner appropriate to such party as described above, similar to the requirements of a Partnership. Bids submitted by a "Joint Venture/Joint Adventure" shall be signed by representatives of each component part of the Joint Venture. The licenses of each component part of the Joint Venture shall also be listed in the bid submittal. Therefore, joint venture bidders hall indicate at least two (2) signatures and two (2) licenses numbers on the Bid Form. Exception: Joint Ventures who have been properly licensed with the Arkansas Contractors Licensing Board as a "Joint Venture" need only to indicate the joint venture license number on the Bid Form. Joint Venture Bidders shall indicate at least two (2) signatures on the Bid Form even if they are licensed as a Joint Venture.

**7.8 DISCLOSURE REQUIREMENTS:**

A. In accordance with Executive Order 98-04, Potential Bidders are hereby notified that any bidder who desires to enter into a contract not exempted from the disclosure requirements, that disclosure is a condition of the contract and that the Owner cannot enter into any such Contract for which disclosure is not made. Potential Bidders are hereby notified that:
   1. Disclosure is required to be a condition of any present or future subcontract for which the total consideration is greater than ten thousand dollars ($10,000).
   2. The Contractor shall require any present of future subcontractor, for which the subcontract amount is greater than $10,000, to complete and sign the contract and Disclosure and Certification. The Contractor shall ensure that any agreement, current or future between the Contractor and subcontractor for which the total consideration is greater than $10,000 shall contain the following:
      a. Failure to make any disclosure required by Governor Executive Order 98-04, or any violation of any rule, regulation or adopted pursuant to that Order, shall be a material breach of the term of this subcontract. The party who fails to make the

required disclosure or who violates the rule, regulation, or policy shall be subject to all legal remedies available to the Contractor.

3. The Contractor shall transmit a copy of the subcontractor's disclosure form to the agency and a statement containing the dollar amount of the subcontract within ten (10) days upon receipt of subcontractor's disclosure.
   a. Note: A copy of the "Contract and Grant Disclosure and Certification Form" is included in these specifications.

**7.9 ARKANSAS BUILDING AUTHORITY'S MINIMUM STANDARDS AND CRITERIA:**

A. Refer to the Arkansas Building Authority's Minimum Standard and Criteria for any and all bidding requirements.
   1. Bidding requirements as outlined in the Arkansas Building Authority's Standards and Criteria will be enforced.

B. The bidding, award and administration of the contract shall be made pursuant to Ark. Code Ann. 14-4-1401 et seq., Arkansas Code Ann. 22-9-101 et seq., Arkansas Code Ann 22-2-101 et seq. and the Arkansas Building Authority Minimum Standards and Criteria.

**7.10 ACCESSIBILITY OF SITE FOR INSPECTIONS:**

A. Inspection: The Contractor awarded this project agrees to allow any Federal, State or Local Inspector, acting in their official capacity, to have access to the job site.

**7.11 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 Contract Documents and does not exceed the funds certified for the project by more than 25%. The Owner shall have the right to waive any formalities in a bid received and to accept that bid which in the Owner's judgement, is in its best interest. The Owner shall have the right to accept any or all bids for a period not to exceed 30 days.

**7.12 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). The drawing will be coordinated by the Architect and Owner in the presence of a witness and tie bidders. The witness shall be selected by the Owner, Architect and approved by the tied bidders. Documentation of the drawing must be included on the bid tabulation and be signed by those present. Nothing in the above and foregoing will diminish the Owner's reserved right to reject any and all bids and to waive formalities.

**7.13 EXECUTION OF CONTRACT:**

A. The apparent low 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 within ten 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.

C. The successful Bidder will be required to furnish Owner with proof of insurance, as prescribed by

the General Conditions and Supplementary General Conditions.

D. Pursuant to Act 157 of 2007, the successful bidder must certify prior to award of the contract that they do not employ or contract with any illegal immigrant(s) in its contract with the State. Bidder shall certify online at http://www.arkansas.gov/dfa/procurement/pro_immigrant.html. The act is printed in full on the website and contains all information regarding any penalties for certification by subcontractors. (Please note that there is an underline between pro and immigrant on the web address.)

## PART 8 - OFFER ACCEPTANCE/REJECTION

### 8.1 DURATION OF OFFER:

A. Bids shall remain open to acceptance and shall be irrevocable for a period of thirty (30) days after the bid closing date.

### 8.2 ACCEPTANCE OF OFFER:

A. Owner reserves the right to accept or reject any or all offers.

### 8.3 ADDITIONAL AMENDMENTS TO AIA DOCUMENT A701-1997:

A. In addition to the above Instruction to Bidders Requirements, the following items specifically amend and supplement AIA DOCUMENT A701 - INSTRUCTIONS TO BIDDERS which is made a part of the instructions to bidders and follows this section:

1. AIA Document A701-1997: Delete 3.4.3.
2. AIA Document A701-1997: Delete last sentence of 4.2.1.
3. AIA Document A701-1997: Article 5.3.1 Revise the first sentence to read "....and does not exceed twenty-five (25%) percent of the funds....Delete 2nd sentence and add "The Owner reserves the right to reject any and all bids and to waive formalities and to accept the bid which in the Owner's judgement is in the best interests".
4. AIA Document A701-1997: Article 5.3.2 Delete paragraph.
5. AIA Document A701-1997: Article 6.2 Delete paragraph.
6. AIA Document A701-1997: Article 7.1.2 Delete 2nd sentence.
7. AIA Document A701-1997: Article 7.1.3 Delete.
8. AIA Document A701-1997: Article 7.2.1 Delete paragraph and insert "The Bidder shall file the Performance and Payment Bond in the county circuit clerk's office where the work is being done. Bonds must bear the Clerk's certification of filing in the county where the work is being done. Deliver the required bonds to the Architect/Engineer prior to the execution of the Contract".
9. AIA Document A701-1997: Article 7.2.2 insert after the first sentence " or the Arkansas Statutory Performance and Payment Bond furnished by Arkansas Building Authority. (see attached) The Bond shall be written in the amount of the Contract Sum".

**END OF INSTRUCTIONS TO BIDDERS**

1997 Edition -Electronic Format

# AIA Document A701 - 1997

# *Instructions to Bidders*

## TABLE OF ARTICLES


1. DEFINITIONS
2. BIDDER'S REPRESENTATIONS
3. BIDDING DOCUMENTS
4. BIDDING PROCEDURES
5. CONSIDERATION OF BIDS
6. POST-BID INFORMATION
7. PERFORMANCE BOND AND PAYMENT BOND
8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR


*THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES. CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.*

DRAFT

## ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

©1997 AIA®
AIA DOCUMENT A701 - 1997
INSTRUCTIONS TO BIDDERS

The American Institute of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

© 1970, 1974, 1978, 1987, © 1997 by The American Institute of Architects. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject he violator to legal prosecution. WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. User Document: rcs-a701.aia -- 4/28/2003. AIA License Number 1138432, which expires on 8/2/2003.

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

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

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

## ARTICLE 2 BIDDER'S REPRESENTATIONS

**2.1** The Bidder by making a Bid represents that:

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

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

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

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

*THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES. CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.*

## ARTICLE 3 BIDDING DOCUMENTS

### 3.1 COPIES

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

**3.1.2** Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

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

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

### 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

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

**3.2.2** Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

©1997 AIA®
AIA DOCUMENT A701 - 1997
INSTRUCTIONS TO BIDDERS

The American Institute of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

© 1970, 1974, 1978, 1987, © 1997 by The American Institute of Architects. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject he violator to legal prosecution. WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. User Document: rcs-a701.aia -- 4/28/2003. AIA License Number 1138432, which expires on 8/2/2003.

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

### 3.3 SUBSTITUTIONS

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

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

*THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES. CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.*

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

**3.3.4** No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

### 3.4 ADDENDA

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

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

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

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

## ARTICLE 4 BIDDING PROCEDURES

### 4.1 PREPARATION OF BIDS

**4.1.1** Bids shall be submitted on the forms included with the Bidding Documents.

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

**4.1.3** Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

**4.1.4** Interlineations, alterations and erasures must be initialed by the signer of the Bid.

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

©1997 AIA®
AIA DOCUMENT A701 - 1997
INSTRUCTIONS TO BIDDERS

The American Institute of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

© 1970, 1974, 1978, 1987, © 1997 by The American Institute of Architects. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject he violator to legal prosecution. WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. User Document: rcs-a701.aia -- 4/28/2003. AIA License Number 1138432, which expires on 8/2/2003.

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

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

## 4.2 BID SECURITY

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

*THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES. CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.*

**4.2.2** If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

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

## 4.3 SUBMISSION OF BIDS

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

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

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

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

## 4.4 MODIFICATION OR WITHDRAWAL OF BID

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

**4.4.2** Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation

©1997 AIA®
AIA DOCUMENT A701 - 1997
INSTRUCTIONS TO BIDDERS

The American Institute of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

© 1970, 1974, 1978, 1987, © 1997 by The American Institute of Architects. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject he violator to legal prosecution. WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. User Document: rcs-a701.aia -- 4/28/2003. AIA License Number 1138432, which expires on 8/2/2003.

over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

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

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

## ARTICLE 5 CONSIDERATION OF BIDS

### 5.1 OPENING OF BIDS

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

*THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES. CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS COMPLETION OR MODIFICATION. AUTHENTICATION OF THIS ELECTRONICALLY DRAFTED AIA DOCUMENT MAY BE MADE BY USING AIA DOCUMENT D401.*

### 5.2 REJECTION OF BIDS

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

### 5.3 ACCEPTANCE OF BID (AWARD)

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

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

## ARTICLE 6 POST-BID INFORMATION

### 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

### 6.2 OWNER'S FINANCIAL CAPABILITY

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

### 6.3 SUBMITTALS

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

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

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

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

©1997 AIA®
AIA DOCUMENT A701 - 1997
INSTRUCTIONS TO BIDDERS

The American Institute of Architects
1735 New York Avenue, N.W.
Washington, D.C. 20006-5292

© 1970, 1974, 1978, 1987, © 1997 by The American Institute of Architects. Reproduction of the material herein or substantial quotation of its provisions without written permission of the AIA violates the copyright laws of the United States and will subject he violator to legal prosecution. WARNING: Unlicensed photocopying violates U.S. copyright laws and will subject the violator to legal prosecution. This document was electronically produced with permission of the AIA and can be reproduced in accordance with your license without violation until the date of expiration as noted below. User Document: rcs-a701.aia -- 4/28/2003. AIA License Number 1138432, which expires on 8/2/2003.

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

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

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

## ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

### § 7.1 BOND REQUIREMENTS

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

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

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

### § 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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

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

## ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

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

AIA Document A701™ – 1997. Copyright © 1970, 1974, 1978, 1987 and 1997 by The American Institute of Architects. All rights reserved.
WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law. This draft was produced by AIA software at 10:09:37 on 06/10/2013 under Order No. 0704180319_1 which expires on

ASA HUTCHINSON
GOVERNOR

STATE OF ARKANSAS
ARKANSAS DEPARTMENT OF LABOR
PREVAILING WAGE DIVISION

LEON JONES, JR.
DIRECTOR

10421 WEST MARKHAM • LITTLE ROCK, AR 72205-2190
Phone: 501-682-4536 Fax: 501-682-4506 TRS: 800-285-1131

February 10, 2017

AC Williams
A.C. Williams, Architect
601 Shadow Ridge Dr
Jonesboro, AR 72404

Re: ANC NEW CENTER FOR ALLIED TECHNOLOGIES
ARKANSAS NORTHEASTERN COLLEGE
BLYTHEVILLE, ARKANSAS
MISSISSIPPI COUNTY

Dear AC Williams:

In response to your request, enclosed is Arkansas Prevailing Wage Determination Number **16-393** establishing the minimum wage rates to be paid on the above-referenced project. These rates were established pursuant to the Arkansas Prevailing Wage Law, Ark. Code Ann. §§ 22-9-301 to 22-9-315 and the administrative regulations promulgated thereunder.

If the work is subject to the Arkansas Prevailing Wage Law, every specification shall include minimum prevailing wage rates for each craft or type of worker as determined by the Arkansas Department of Labor Ark. Code Ann. § 22-9-308 (b) (2). Also, the public body awarding the contract shall cause to be inserted in the contract a stipulation to the effect that not less than the prevailing hourly rate of wages shall be paid to all workers performing work under the contract. Ark. Code Ann. § 22-9-308 (c).

Additionally, the scale of wages shall be posted by the contractor in a prominent and easily accessible place at the work site. Ark. Code Ann. § 22-9-309 (a).

Also enclosed is a **"Statement of Intent to Pay Prevailing Wages"** form that should be put in your specifications along with the wage determination. The General/Prime Contractor is responsible for getting this form filled out and returned to this office within 30 days of the Notice to Proceed for this project.

***When you issue the Notice to Proceed for this project, please send a copy of the notice to my office.***

If you have any questions, please call me at (501) 682-4536 or fax (501) 682-4506.

Sincerely,

Lorna Kay Smith

Lorna K. Smith
Prevailing Wage Division

Enclosures

# Arkansas Department of Labor Prevailing Wage Determination

**Date:** 2/10/2017 **Determination #:** 16-393 **Expires:** 8/10/2017

**Project:** ANC New Center for Allied Technologies

**Site:** Arkansas Northeastern College

**City:** Blytheville, Arkansas

**Project County:** **Mississippi** **Survey#:** 716-AR11

| COUNTY(S) | Group |
|---|---|
| Clay | 11 |
| Craighead | |
| Greene | |
| Mississippi | |
| Poinsett | |

| CLASSIFICATION | Basic Hourly Rate | Fringe Benefits |
|---|---|---|
| Asbestos Worker/Insulator | $15.40 | |
| Boilermaker | $17.38 | $4.79 |
| Bricklayer/Pointer, Cleaner, Caulker, Stone Mason | $19.15 | |
| Carpenter | $14.50 | |
| Concrete Finisher/Cement Mason | $14.00 | |
| Electrician/Alarm Installer | $17.50 | $2.10 |
| Glazier | $12.00 | |
| HVACR Mechanic (Excludes Duct Work) | $16.45 | $1.15 |
| Ironworker (Including Reinforcing Work) | $15.00 | |
| Laborer | $10.35 | |
| Marble/Tile/Terrazzo | $12.00 | |
| Metal Building Erector | $15.20 | |
| Millwright | $15.95 | $3.70 |
| Painter/Sheet Rock Finisher | $14.30 | |
| Plumber/Pipefitter | $17.45 | $2.00 |
| Roofer | $13.25 | |
| Sheet Metal (Includes Duct Work) | $22.34 | $13.09 |
| Sprinkler Fitter | $20.60 | $2.95 |
| Group 1 - Operator | $15.20 | $2.65 |
| Group 2 - Operator | $16.70 | |
| Group 3 - Operator | $16.11 | |
| Group 4 - Operator | $12.00 | |
| Laborer (Brick/Stone Tender) | $12.00 | |
| Truck Driver (Excludes Dump Truck) | $15.00 | $3.45 |
| Fence Installer | $12.00 | |

Welders-receive rate prescribed for craft performing operation to which welding is incidental.

**Certified 7/1/2016**

***Classifications that are required, but not listed above, must be requested in writing from the Arkansas Department of Labor, Prevailing Wage Division. Please call (501) 682-4536 for a request form.***

**STATEMENT OF INTENT TO PAY PREVAILING WAGES**

PROJECT: **ANC NEW CENTER FOR ALLIED TECHNOLOGIES**
**ARKANSAS NORTHEASTERN COLLEGE**
**BLYTHEVILLE, ARKANSAS**
**MISSISSIPPI COUNTY**

This is to certify that we, the following listed contractors, are aware of the wage requirements of the Arkansas Prevailing Wage Law and by signature below indicate our intent to pay no less than the rates established by **Arkansas Prevailing Wage Determination Number 16-393** for work performed on the above noted public project. I understand that contractors who violate prevailing wage laws, i.e., incorrect classification/scope of work of workers, improper payments of prevailing wages, etc., are subject to fines and will be required to pay back wages due to workers.

| | **Business Name** | **Address** | **Phone#** | **Signature and Title of Business Official** |
|---|---|---|---|---|
| General/Prime Contractor | | | | |
| Electrical Subcontractor | | | | |
| Mechanical Subcontractor | | | | |
| Plumbing Subcontractor | | | | |
| Roofing/ Sheet Metal Subcontractor | | | | |

THE GENERAL/PRIME CONTRACTOR IS RESPONSIBLE FOR GETTING THIS FORM FILLED OUT AND RETURNING IT TO THE ARKANSAS DEPARTMENT OF LABOR ***WITHIN 30 DAYS OF THE NOTICE TO PROCEED*** FOR THIS PROJECT. RETURN COMPLETED FORM TO THE ARKANSAS DEPARTMENT OF LABOR, PREVAILING WAGE DIVISION, 10421 W. MARKHAM, LITTLE ROCK, ARKANSAS, 72205.

## Power Equipment Operators:

### Group I
Operators engaged in operating the following equipment: Cranes, draglines, shovels and piledrivers with a lifting capacity of 50 tons or over, and operators of all tower climbing cranes and derricks required to work 25 feet or over from the ground, blacksmith and mechanics.

### Group II
Operators engaged in operating the following equipment or performing work relative to the engineer's jurisdiction: Hydraulic cranes, cherry pickers, backhoes, and all derricks with a lifting capacity less than 50 tons, as specified by the manufacturer, all backhoes, tractor or truck type, all overhead & traveling cranes, or tractors with swinging boom attachments, gradealls all above equipment irrespective of motive power, leverman (engineer), hydraulic or bucket dredges, irrespective of size, trackhoes, excavators.

### Group III
Heavy Equipment Operators. Operators engaged in operating the following equipment: all bulldozers, all front end loaders, all sidebooms, skytracks, forklifts, all push tractors, all pull scrapers, all motor graders, all trenching machines, regardless of size or motive power, all backfillers, all central mixing plants, 10S and larger, finishing machines, all boiler fireman high or low pressure, all asphalt spreaders, hydro truck crane, multiple drum hoist, irrespective of motive power, all rotary, cable tool, core drill or churn drill, water well and foundation drilling machines, regardless of size, regardless of motive power and dredge tender operator, asphalt paving machines.

### Group IV
Light Equipment Operators. Operators engaged in operating the following equipment: Oilerdriver motor crane, single drum hoists, winches and air tuggers, irrespective of motive power, winch or A frame trucks, rollers of all types and pull tractors, regardless of size, elevator operators inside and outside when used for carrying workmen from floor to floor and handling building material, Lad-A-Vator Conveyor, batch plant, and mortar or concrete mixers, below 10S, end dump euclid, pumpcrete spray machine and pressure grout machine, air compressors, regardless of size. All light equipment, welding machines, light plants, pumps, all well point system dewatering and portable pumps, space heaters, irrespective of size, and motive power, equipment greaser, oiler, mechanic helper, drilling machine helper, asphalt distributor and like equipment, safety boat operator and deckhand.

# SECTION 00300
# INFORMATION AVAILABLE TO BIDDERS

## PART 1 - EXISTING REPORTS AND SURVEYS

### 1.1 SUBSURFACE INVESTIGATION REPORT:

A. A copy of a geotechnical report with respect to the building site is included with this document. See Section 02010 Soils Investigation Report.

B. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect.

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

### 1.2 TOPOGRAPHIC SURVEY:

A. A copy of a topographic survey with respect to the project site is included as a part of the contract documents.

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

**END OF SECTION**

**SECTION 00410**
**BID FORM**

## PART 1 - THE PROJECT AND THE PARTIES

**1.1 TO:**

Arkansas Northeastern College, (The Owner)
2501 South Division
Blytheville, Arkansas 72315

**1.2 FOR:** New Allied Center for Allied Technologies building on the Campus of Arkansas Northeastern College, Blytheville, Arkansas

**1.3 DATE:** _____ (Bidder to Enter Date)

**1.4 SUBMITTED BY:** (Bidder to Enter Name and Address)

A. Bidders's Full Name: _____
   1. Address: _____
   2. City, State, Zip: _____
   3. Phone #/Fax #: _____
   4. Bidder's Contractor's License Number or Contractor's Joint Venture License Number: _____

**1.5 OFFER:**

A. Having examined the Place of the Work and All matters referred to in the Instruction to Bidders and the Contract Documents prepared by A. C. Williams, Architect for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work, within the set forth, for the Total Sum of:

   1. _____ _____($_____).
   (Amount shall be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

B. We have included the required security, Bid Bond or Cashier's Check, in an amount equal to not less than five percent (5%) of the total bid offered, if the bid is in excess of $20,000.00, as required by the Instruction to Bidders.

C. All applicable federal taxes are included and State of Arkansas taxes are included in the Bid Sum.

**1.6 ACCEPTANCE:**

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

B. The undersigned understands that the Owner reserves the right to reject all bids and to waive any formality.

C. If this bid is accepted by Owner within the time period stated above, we will:
   1. Execute the Agreement within ten (10) days of receipt of Notice to Award.
   2. Furnish the required bonds within ten (10) days of receipt of Notice to Award.
   3. Commence work within five (5) calendar days after written Notice to Proceed of this bid.

D. 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 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.

E. 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.

F. The undersigned understands that the Owner's intent is to construct all facilities proposed within limits established by the funds appropriated for the project.

G. The undersigned agrees to pay all prevailing hourly wage rates prescribed and mandated by the Arkansas Department of Labor Pursuant to Ark. Code Ann. 22-9-301 et seq..

**1.7 CONTRACT TIME:**

A. If this Bid is accepted we will:
1. Begin the construction five (5) calendar days following the issuance of the Notice to Proceed and be Substantially Complete, ready for Owner occupancy not later than June 1, 2018.

B. Should the undersigned fail to fully complete the work within the above stated time, he shall pay the Owner as fixed, agreed and liquidated damages and not as a penalty, the sum of Five Hundred Dollars ($500.00) for each calendar day of delay until work is completed or accepted.

**1.8 UNIT PRICES:**

A. The following are Unit Prices for specific portions of the Work as listed. The Bidder agrees that the following Unit Prices shall govern additions or deductions to the Base Proposal during the course of the Work. The following is the list of Unit Prices:
1. The requirement to remove undesirable soils shall constitute an increase in the contract amount using Unit Price No. 1 stated below:
   a. Unit Price No.1: Removal of Undesirable Soil - $'s per cubic yard = $_____ (bidder to enter amount). This amount shall include all costs for labor, equipment, materials, Contractor's overhead, profit, insurance, taxes, and all other related costs to remove any undesirable soils at the site. Undesirable soils shall be removed from site if they can not be disposed of in a proper and acceptable manner on the site.

2. The Contractor agrees to replace all removed rock and undesirable soils with compacted structural fill material as defined in Section 02316 Fill and Backfill. The requirement to provide this additional structural fill material shall constitute an increase in the contract amount using Unit Price No. 2 stated below:
   a. Unit Price No. 2: Installation of Compacted Structural Fill - $'s per cubic yard = $_____ (bidder to enter amount). This amount shall included all costs for labor, equipment, materials, Contractor's overhead, profit, insurance, taxes, and all other related costs.
3. The requirement to increase under cut depth if dictated by below grade conditions as determined by the Geotechnical Engineer shall constitute an increase in price using Unit Price No. 3 stated below:
   a. Unit Price No. 3: Increase/Decrease Undercut Excavation - $'s per cubic yard = $_____ (increase undercut) (bidder to enter amount). This amount shall include all costs for labor, equipment, materials, Contractor's

overhead, profit, insurance, taxes, and all other related costs to increase undercut excavation as determined and requested by the Owner's Geotechnical Engineer if required due to actual subgrade conditions encountered at the site.

4. The requirement to increase footing depth (bottom of footing elevation) if dictated by below grade conditions as determined by the Geotechnical Engineer shall constitute an increase in price using Unit Price No. 4 stated below:
   a. Unit Price No. 4: Increase Footing Depth - $'s per foot depth per linear feet = $_____ (bidder to enter amount). This amount shall included all costs for labor, equipment, concrete, reinforcing, concrete block, other materials, Contractor's overhead, profit, insurance, taxes, and all other related costs to increase footing depth (bottom of footing elevation) as determined and requested by the Owners' Geotechnical Engineer if required due to actual subgrade condition encountered at the site.

## 1.9 BREAKDOWN OF SUBCONTRACTORS BIDS:

A. For the Owner's accounting purposes, Contractors submitting a bid are required to state separately the prices included as part of the overall bid related to the Mechanical (HVAC), Plumbing, and Electrical portions of the work as indicated by the Contract Documents.
   1. Mechanical (HVAC): $_____.
   2. Plumbing: $_____.
   3. Electrical : $_____.
   4. Fire Sprinklers: $_____.

## 1.10 BREAKDOWN OF CAMPUS WIDE DRAINAGE:

A. For the Owner's accounting purposes, Contractors submitting a bid are required to break out the price included as part of the overall base bid related to all campus grading and drainage work including materials and labor, and associated portions of bonds, insurance, overhead, profit, taxes, etc. shown on Civil Sheets C12 thru C15 as if this work were a "stand alone" project.
   1. $_____.

## 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.
   1. Addendum #_____ Dated_____.
   2. Addendum #_____ Dated_____.
   3. Addendum #_____ Dated_____.
   4. Addendum #_____ Dated_____.

## 1.12 LISTING OF MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING CONTRACTORS:

A. Bidder is required to list the name of the proposed separate subcontractors, including self if applicable, for Mechanical, Plumbing, Electrical and Roofing work. All prime Contractors, as a condition to perform construction with the State of Arkansas, shall use no other subcontractors when the subcontractors' portion of the project is $20,000 or more, except those qualified and licensed by the Contractors Licensing Board in Mechanical (HVAC-R), Plumbing, Electrical and Roofing. For those bids where the listed work is $20,000 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 $20,000 or more. The Prime Contractor may use his own forces to do the listed work, however if the listed work is $20,000 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 $20,000 or more. In the event the amount of the listed work is below $20,000, the Prime Contractor shall pace 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 $20,000. Failure to fill the form correctly shall cause the bid to be declared non-responsive and the bid will not receive consideration. ALL MECHANICAL, PLUMBING, ELECTRICAL AND ROOFING SUBCONTRACTORS SHALL BE LISTED REGARDLESS OF QUALIFICATIONS, LICENSURES OR WORK AMOUNT. BIDDERS SHOULD CONSULT IN THE PROJECT MANUAL ON HOW TO FILL OUT THIS FORM. FAILURE TO NAME THE SUBCONTRACTORS IN THE SPACE PROVIDE SHALL CAUSE THE BID TO BE DECLARED NON-RESPONSIVE AND THE BID WILL NOT RECEIVE CONSIDERATION. Indicate the Name(s) of each entity performing the listed work:

1. Mechanical: (Indicative of HVAC)

   _____

   License # _____ Is the amount of work $20,000 or over: Yes ___ No ___

2. Plumbing:

   _____

   License # _____ Is the amount of work $20,000 or over: Yes ___ No ___

3. Electrical: (Indicative of wiring and illuminating fixtures)

   _____

   License # _____ Is the amount of work $20,000 or over: Yes ___ No ___

4. Roofing and Sheetmetal: (Indicative of roofing applications)

   _____

   License # _____ Is the amount of work $20,000 or over: Yes ___ No ___

**1.13 USE OF SMALL, MINORITY, AND WOMEN BUSINESS ENTERPRISES:**

A. Per Act 1310 of the State of Arkansas all Bidders are encouraged to use small, minority, and women owned businesses on all projects.

**1.14 BID FORM SIGNATURE(S):**

A. The Corporate Seal of

_____

(Name of Bidder - Print or type the full name of your firm)

was hereunto affixed in the presence of:

_____

(Authorized signing officer, Title)

(Seal)

_____

(Authorized signing officer, Title)

_____

(Federal ID Number or SSN #)

**1.15 IF THE BID IS A JOINT VENTURE OR PARTNERSHIP, ADDITIONAL FORMS FOR EXECUTION FOR EACH MEMBER OF THE JOINT VENTURE IN THE APPROPRIATE FORM OR FORMS AS ABOVE. BIDS SUBMITTED BY A "JOINT VENTURE/JOINT ADVENTURE" SHALL BE SIGNED BY REPRESENTATIVES OF EACH COMPONENT PART OF THE JOINT VENTURE. THE LICENSES OF EACH COMPONENT PART OF THE JOINT VENTURE SHALL ALSO BE LISTED IN THE BID SUBMITTAL.. THEREFORE, JOINT VENTURE BIDDERS SHALL INDICATE AT LEAST TWO (2) SIGNATURES AND TWO (2) LICENSES NUMBERS ON THE BID FORM. EXCEPTION: JOINT VENTURES WHO HAVE BEEN PROPERLY LICENSED WITH THE ARKANSAS CONTRACTORS LICENSING BOARD AS A "JOINT VENTURE" NEED ONLY TO INDICATE THE JOINT VENTURE LICENSE NUMBER ON THE BID FORM. JOINT VENTURE BIDDERS SHALL INDICATE AT LEAST TWO (2) SIGNATURES ON THE BID FORM EVEN IF THEY ARE LICENSED AS A JOINT VENTURE.**

**END OF SECTION**

# ATTACHMENT - A ACONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

Failure to complete all of the following information may result in a delay in obtaining a contract, lease, purchase agreement, or grant award with any Arkansas State Agency.

SOCIAL SECURITY NUMBER — — OR FEDERAL ID NUMBER —

TAXPAYER ID #:

SUBCONTRACTOR: ☐Yes ☐No

SUBCONTRACTOR NAME:

IS THIS FOR:

TAXPAYER ID NAME: ☐ Goods? ☐ Services? ☐ Both?

YOUR LAST NAME: FIRST NAME: M.I.:

ADDRESS:

CITY: STATE: ZIP CODE: — COUNTRY:

***AS A CONDITION OF OBTAINING, EXTENDING, AMENDING OR RENEWING A CONTRACT, LEASE, PURCHASE AGREEMENT, OR GRANT AWARD WITH ANY ARKANSAS STATE AGENCY, THE FOLLOWING INFORMATION MUST BE DISCLOSED:***

## FOR INDIVIDUALS *

Indicate below if: you, your spouse or the brother, sister, parent, or child of you or your spouse *is* a current or former: member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee:

| Position Held | Mark (√) | | Name of Position of Job Held [senator, representative, name of board/ commission, data entry, etc.] | For How Long? | | What is the person(s) name and how are they related to you? [i.e., Jane Q. Public, spouse, John Q. Public, Jr., child, etc.] | |
|---|---|---|---|---|---|---|---|
| | Current | Former | | From MM/YY | To MM/YY | Person's Name(s) | Relation |
| General Assembly | (1) | (2) | | | | | |
| Constitutional Officer | (3) | (4) | | | | | |
| State Board or Commission Member | (5) | (6) | | | | | |
| State Employee | (7) | (8) | | | | | |

☐ (9) **None of the above applies**

## FOR AN ENTITY (BUSINESS) *

Indicate below if any of the following persons, current or former, hold any position of control or hold any ownership interest of 10% or greater in the entity: member of the General Assembly, Constitutional Officer, State Board or Commission Member, State Employee, or the spouse, brother, sister, parent, or child of a member of the General Assembly, Constitutional Officer, State Board or Commission Member, or State Employee. Position of control means the power to direct the purchasing policies or influence the management of the entity.

| Position Held | Mark (√) | | Name of Position of Job Held [senator, representative, name of board/commission, data entry, etc.] | For How Long? | | What is the person(s) name and what is his/her % of ownership interest and/or what is his/her position of control? | | |
|---|---|---|---|---|---|---|---|---|
| | Current | Former | | From MM/YY | To MM/YY | Person's Name(s) | Ownership Interest (%) | Position of Control |
| *General Assembly | (A) | (B) | | | | | | |
| Constitutional Officer | (C) | (D) | | | | | | |
| State Board or Commission Member | (E) | (F) | | | | | | |
| State Employee | (G) | (H) | | | | | | |

☐ (J) **None of the above applies**

**NOTE:** *PLEASE LIST ADDITIONAL DISCLOSURES ON SEPARATE SHEET OF PAPER IF MORE SPACE IS NEEDED*



7/1/98 Rev. 11/29/00

## ATTACHMENT - A ACONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM

***Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this contract. Any contractor, whether an individual or entity, who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the agency.***

**As an additional condition of obtaining extending Amending, or renewing a contract with a *state agency* I agree as follows:**

1. Prior to entering into any agreement with any subcontractor, prior or subsequent to the contract date, I will require the subcontractor to complete a **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM**. Subcontractor shall mean any person or entity with whom I enter an agreement whereby I assign or otherwise delegate to the person or entity, for consideration, all, or any part, of the performance required of me under the terms of my contract with the state agency.

2. I will include the following language as a part of any agreement with a subcontractor:

   *Failure to make any disclosure required by Governor's Executive Order 98-04, or any violation of any rule, regulation, or policy adopted pursuant to that Order, shall be a material breach of the terms of this subcontract. The party who fails to make the required disclosure or who violates any rule, regulation, or policy shall be subject to all legal remedies available to the contractor.*

3. No later than ten (10) days after entering into any agreement with a subcontractor, whether prior or subsequent to the contract date, I will mail a copy of the **CONTRACT AND GRANT DISCLOSURE AND CERTIFICATION FORM** completed by the subcontractor and a statement containing the dollar amount of the subcontract to the state agency.

***I certify under penalty of perjury, to the best of my knowledge and belief, all of the above information is true and correct and that I agree to the subcontractor disclosure conditions stated herein.***

Signature_____ Title_____ Date_____

Vendor Contact Person_____ Title_____ Phone No._____

*AGENCY USE ONLY*

Agency Number_____ Agency Name_____ Agency Contact Person_____ Contact Phone No._____ Contract or Grant No._____

**NOTE: PLEASE LIST ADDITIONAL DISCLOSURES ON SEPARATE SHEET OF PAPER IF MORE SPACE IS NEEDED*



7/1/98 Rev.11/29/00

# PERFORMANCE BOND AND PAYMENT BOND

We _____, hereinafter referred to as Principal, and _____, hereinafter referred to as Surety, are held and firmly bound unto _____, as obligee, hereinafter referred to as Owner, in the initial Contract amount of $ _____, said amount to be deemed a performance bond payable to Owner under the terms of this Performance and Payment Bond Agreement. The Principal and Surety state that the Surety is a solvent corporate surety company authorized to do business in the State of Arkansas.

Principal has by written agreement dated _____ entered into a capital improvement contract (Contract) with the Owner for: _____

_____

_____

_____. The above referenced Contract is incorporated herein by reference.

Under this Performance and Payment Bond Agreement, the Principal and Surety shall be responsible for the following:

a. The Principal shall faithfully perform the above referenced Contract, which is incorporated herein by reference and shall pay all indebtedness for labor and materials furnished or performed under the Contract.

b. In the event that the Principal fails to perform the Contract, the Principal and the Surety, jointly and severally, shall indemnify and save harmless the Owner from all cost and damage which the Owner may suffer by reason of Principal's failure to perform the Contract. Said indemnification shall include, but not be limited to, full reimbursement and repayment to the Owner for all outlays and expenses which the Owner may incur in making good any such default or failure to perform the Contract by the Principal.

c. Principal shall pay all persons all indebtedness for labor or material furnished or performed under the Contract and in doing so this obligation shall be null and void. In the event that Principal fails to pay for such indebtedness, such persons shall have a direct right of action against the Principal and Surety, jointly and severally, under this obligation, subject to the Owner's priority.

d. Principal shall guarantee the faithful performance of the prevailing hourly wage clause as provided in the Contract.

This bond is given in accordance with Arkansas laws and regulations, including Ark. Code Ann § 18-44-503, §19-4-1405, and § 22-9-401 et seq. The Surety guarantees that the Principal shall comply with Ark. Code Ann. § 22-9-308 (d) by payment and full compliance with all prevailing hourly wage contract provisions where the contract amount exceeds the amount provided in Ark. Code Ann. § 22-9-302(1).

Any changes made in the terms of the Contract including but not limited to the amount of the contract, or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the contract, or any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal and the Surety or Sureties or either or any of them, their heirs, personal representatives, successors or assigns from their liability hereunder, notice to and consent of the Surety or Sureties of any such change, extension or forbearance being are hereby voluntarily waived. In no event shall the aggregate liability of the Surety exceed the Contract documents.

This Performance and Payment Bond Agreement is binding upon the above named parties, and their successors, heirs, assigns and personal representatives.

Executed by the parties who individually represent that each voluntarily enters into and has the authority to enter into this agreement.

BY: _____
Contractor Date

BY: _____
Arkansas Resident Agent or Non Resident Agent/ Attorney-in-Fact Date

Print : Agent's Name _____
Date

Address _____

City County State Zip Code

Business #: _____ Fax #: _____

E-Mail: _____

## ***PERFORMANCE AND PAYMENT BOND AMENDMENT #____***

We, _____hereinafter referred to as Principal, and _____, hereinafter referred to as Surety, have entered into an agreement entitled "Performance and Payment Bond", with _____as obligee hereinafter after known as Owner Agency. Furthermore, we agree that said bond agreement, which was filed in the county of _____on the _____ day of _____, 20___ and this amendment #____ is hereby incorporated into said bond agreement and any previous amendment(s) therein. This amendment shall be upon the same terms and conditions as set forth in the Bond Agreement, including any amendments, except the Agreement shall be amended and modified as follows:

1. The total aggregate amount for the Bond Agreement shall be $_____ dollars. This amended amount reflects those costs, time for completion and other terms of the Contract associated with said bond agreement and Change Order(s) #_____ for the project contract entered into between Principal and Owner Agency.

2. This Performance and Payment Bond Agreement Amendment is binding upon the above named parties, and their successors, heirs, assigns and personal representatives. The Bond Agreement as hereby extended, amended and modified is hereby ratified and confirmed by the parties who individually represent that each has the authority to enter into this amended agreement.

BY:_____
Contractor Date

BY:_____
Arkansas Resident Local Agent/Attorney-in-fact Date
(In accordance with Arkansas Code Annotated §22-9-402(b)(1)(2))

_____
Agent Date

_____
Address Business Phone/Fax #

_____
City County State Zip Code

**ARKANSAS STATUTORY PERFORMANCE AND PAYMENT BOND AMENDMENT IS THE ONLY BOND AMENDMENT FORM STATE BUILDING SERVICES WILL ACCEPT.**

**SECTION 00500**
**AGREEMENT**

**PART 1 - FORM OF AGREEMENT**

**THE FOLLOWING FORMS AND DOCUMENTS REFERENCED ARE HEREBY MADE A PART OF THESE CONTRACT DOCUMENTS AS IF CONTAINED HEREIN AND ARE THEREFORE A PART OF THE CONTRACT BETWEEN THE OWNER AND CONTRACTOR. THE CONTRACTOR SHALL THEREFORE ADHERE TO THE REQUIREMENTS OF THESE DOCUMENTS.**

**CONTRACTORS NOT FAMILIAR WITH THE CONTENTS OF THESE DOCUMENTS MAY CONTACT THE ARCHITECT TO OBTAIN COPIES.**

**1.1 AIA DOCUMENT A101, OWNER-CONTRACTOR AGREEMENT FORM - STIPULATED SUM 1997 EDITION, FORMS THE BASIS OF CONTRACT BETWEEN THE OWNER AND CONTRACTOR.**

**1.2 AIA DOCUMENT A201, GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, FIFTEENTH EDITION, 1997.**

**1.3 AIA DOCUMENT A701, INSTRUCTIONS TO BIDDERS, 1997 EDITION.**

**1.4 AIA DOCUMENT G701, CHANGE ORDER, 2000/2001 EDITION.**

**1.5 AIA DOCUMENT G702, APPLICATION AND CERTIFICATION FOR PAYMENT, 1992 EDITION AND G703 CONTINUATION SHEET, 1992 EDITION.**

**1.6 AIA DOCUMENT G704, CERTIFICATE OF SUBSTANTIAL COMPLETION, 2000 EDITION.**

**1.7 AIA DOCUMENT G706, CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS AND G706A CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS, 1994 EDITIONS.**

**1.8 AIA DOCUMENT G707, CONSENT OF SURETY, 1994 EDITION.**

**1.9 AIA DOCUMENT G805, LIST OF SUBCONTRACTORS, 2001 EDITION**

**END OF SECTION**

# SECTION 00700
# GENERAL CONDITIONS

## PART 1 - GENERAL

### 1.1 FORM OF GENERAL CONDITIONS:

A. AIA Document A201, General Conditions of the Contract for Construction, Fifteenth Edition, 1997 is made a part of these Contract Documents, as if included herein, and is the General Conditions Between the Owner and Contractor. This document may be obtained from Architect by the Contractor if needed.

### 2.1 SUPPLEMENTARY CONDITIONS:

A. Refer to Document 00800 for Amendments to these General Conditions.

**END OF SECTION**

**SECTION 00800**
**SUPPLEMENTARY CONDITIONS**

**PART 1 - INTENT**

**1.1 THESE SUPPLEMENTARY CONDITIONS AMEND AND SUPPLEMENT THE GENERAL CONDITIONS DEFINED IN DOCUMENT 00700 AND OTHER PROVISIONS OF THE CONTRACT DOCUMENTS AS INDICATED BELOW. ALL PROVISIONS WHICH ARE NOT SO AMENDED OR SUPPLEMENTED REMAIN IN FULL FORCE AND EFFECT.**

**1.2 THE TERMS USED IN THESE SUPPLEMENTARY CONDITIONS WHICH ARE DEFINED IN THE GENERAL CONDITIONS HAVE THE MEANINGS ASSIGNED TO THEM IN THE GENERAL CONDITIONS.**

**PART 2 - MODIFICATIONS TO AIA A201**

**2.1 GENERAL:**

A. AIA Document A201-1997. Delete all references to arbitration and mediation.

B. AIA Document A201-1997. Delete all references to Change Directives.

**2.2 ARTICLE 1; GENERAL PROVISIONS:**

A. 1.2.3. In the event of conflicts or discrepancies amount the Contract Documents, interpretations will be based on the following priorities:
1. The Agreement
2. Addenda, with those of later date having precedence over those of earlier date.
3. The Supplementary Conditions
4. The General Conditions of the Contract for Construction.
5. Drawings and Specifications.

**2.3 IN THE CASE OF AN INCONSISTENCY BETWEEN DRAWINGS AND SPECIFICATIONS OR WITHIN EITHER DOCUMENT NOT CLARIFIED BY ADDENDUM, THE BETTER QUALITY OR GREATER QUANTITY OF WORK SHALL BE PROVIDED IN ACCORDANCE WITH THE ARCHITECT'S INTERPRETATION.**

**2.4 ARTICLE 2 - OWNER:**

A. AIA Document A201 - 1997, 2.1.2 - Delete.

B. AIA Document A201 - 1997, 2.2.1 - Delete.

**2.5 ARTICLE 4 - ADMINISTRATION OF THE CONTRACT:**

A. AIA Document A201 - 1997, 4.1.3 - Delete.

**2.6 ARTICLE 5 - SUBCONTRACTORS:**

A. AIA Document A201 -1997, Article 5.2 - This paragraph should not include the subcontractors protected under ACA 22-9-204.

B. The Contractor may not change those Subcontractors listed on the proposal without the written

approval of the Owner and Architect. The Contractor shall submit written evidence, which includes but is not limited to, that the substituted contractor is costing the same amount of money or less and if costing less, that the saving will be deducted from the total contract of the Prime Contractor and rebated to the Owner prior to any approval. The Contractor shall submit his request to the Architect who then shall review the request, if approved, the request and approval shall be forwarded to the Owner. The Contractor shall not be relieved of any liabilities under this Contract, but shall be fully responsible for any Subcontractor or work by said Subcontractor where Subcontractor is employed by the Contractor to perform work under this Contract. Nothing contained in the Contract Documents shall create contractual relations between any Subcontractor and the Owner.

**2.7 ARTICLE 7.2 - CHANGE ORDERS:**

A. AIA Document A201-1997, Article 7.2 - Delete paragraph and insert:

1. A. All requests for changes, additions or deductions, shall be submitted in a complete itemized breakdown acceptable to Arkansas Building Authority, Construction Section and the State Agency.
   a. 1. Change Orders must be submitted using AIA Document G701 - 2000 Change Order Form.
   b. 2. The General Contractor must attach new F-1 and F-2 Contract and Grant Disclosure Form(s) signed and dated no more than ten days prior to the Contractor's execution of the Change Order.
   c. 3. The General Contractor must declare in the space provided on the Change Order Form that there "are", or "are not" new or additional subcontractors which are required to provide is closure pursuant to the Governor's Executive Order 98-04.
   d. 4. Should the General Contractor respond in the affirmative to "3" above, completed F-1 and F-2 Forms for the new or additional subcontractors must also be attached to the Change Order.
   e. 5. Disclosure Forms are required for all contractors (general and subs) who perform work valued at $10,000 or more. E/O 98-04 necessitates form submittals for subcontractors added during the course of a project, as well as those named during the bid process.
   f. 6. Change Order Submittals must be accompanied by a related Performance and Payment Bond Amendment with the executing Agent's Power of Attorney attached. Bond Amendments must bear the Clerk's certification of filing in the county where the work is being done.
2. B. If and wherein unit prices are stated in the contract, submit itemized break down showing each unit price and it's quantities.
3. C. The Contractor shall present an itemized accounting together with appropriate supporting data or the purposes of considering additions or deductions. Supporting data shall include but is not limited to the following:
   a. 1. cost 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. 2. cost of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed.
   c. 3. rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others.
   d. 4. costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
   e. 5. additional costs of supervision and field office personnel directly attributable to the change.

f. 6. the value of all such additions and deductions shall then be computed as set forth in Paragraph "D".

4. The burden of proof of cost rests upon the Contractor. Contractor agrees that State Building Services or Agency's representative shall have the right, at reasonable times, to inspect and audit the books and records of Contractor to verify the propriety and granting of such cost.

5. D. Compute requests for changes be they additions or deductions as follows:

a. (1) For work performed by the Contract -

| | | |
|---|---|---|
| 1. | New cost of material | a |
| 2. | State Sales Tax | b |
| 3. | Net Placing cost | c |
| 4. | W.C. Insurance Premium and FICA Tax | d |
| 5. | Sub-total | a+b+c+d |
| 6. | Overhead and profit, 12% x (a+b+c+d) | e |
| 7. | Allowable Bond Premium | f |
| 8. | TOTAL COST | a+b+c+d+e+f |

b. (2) Credit for work omitted shall be computed as outlined in (1) "a through e" except the contractor's share of overhead and profit percentage is 7%.

c. (3) For work performed by Subcontractors:

1. 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 change of five (5%) percent plus the allowable bond premium.

## 2.8 ARTICLE 7.3 - CONSTRUCTION CHANGE DIRECTIVES:

A. AIA Document A201-1997 - Delete all references to Change Directives.

## 2.9 ARTICLE 9 - PAYMENTS AND COMPLETION:

A. AIA Document A201-1997, Article 9.3 is to comply with ACA 22-9-601 (Retainage).

B. AIA Document A201-1997, Article 9.4 - The following should be added:

1. Payment to the Contractor: 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 payment shall be made. Ark Code Ann. 19-4-1411 allows a maximum processing time for contractor payment requests. The Architect is allowed five (5) work days. Transmittal times are not included in processing. Failure of any of the above to complete processing within the time allowed can result in a penalty being assessed against the responsible agency.

C. AIA Document A201-1997, Article 9.6 - The following should be added:

1. Arkansas Building Authority 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. 1. When periodic payments are made, then One Hundred percent (100%) will be withheld in accordance with Arkansas Code Annotated 22-9-601 et. seq.;

b. 2. Defective work not remedied;

c. 3. Third party claims files or reasonable evidence indicating problem filing to such claims;

d. 4. Failure of the Contractor to make payments properly to subcontractors or for labor, materials or equipment, also see A2-12.2;

e. 5. Reasonable evidence that the work cannot be completed within the contract

time; or

f. 6. Damage to the Owner or another contractor;

g. 7. Reasonable evidence that the work will not be completed within the contract time; or

h. 8. Persistent failure to carry out the work in accordance with the Contract Documents.

D. AIA Document A201-1997, Article 9.7 - Delete paragraph.

E. AIA Document A201-1997, 9.10.4 - Delete the word "Liens".

**2.10 ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY:**

A. AIA Document A201-1997, 10.3.3 - Delete.

B. AIA Document A201-1997, 10.5 - Delete.

**2.11 ARTICLE 11 - INSURANCE AND BONDS:**

A. 11.1 Contractor's Liability Insurance.

B. 11.1.1 In the fourth line following the work "located" insert the work "to which the Owner has no objection".

C. 11.1.1.8 Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis.

D. 11.1.1.9 If the General Liability coverage is provided by a Commercial General Liability Policy on a claims-made basis, the policy date or retroactive date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverage required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

E. Add the following clause 11.1.2.1 to 11.1.2:

1. 11.1.2.1 - the insurance required by Subparagraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:

a. 1. Workmen's Compensation - Statutory Requirements.

b. 2. Comprehensive General Liability Insurance shall be maintain with aggregate limit of not less than $2,000,000.00.

c. 3. Comprehensive Automobile Liability Insurance $500,000 combined single limit for both Bodily Injury and Property Damage.

d. 4. Owner's and Contractor's Protective Liability Insurance shall be maintained with aggregate limit not less than $2,000,000.00 with Architect as additional insured.

F. AIA Document A201-1997, 11.2 - Delete.

G. AIA Document A201-1997, 11.4 - Delete and insert:

1. 11.4 CONTRACTOR'S LIABILITY INSURANCE

2. 11.4.1 The Contractor shall secure and maintain in force during his Contract such insurance from an insurance company authorized to write the prescribed insurance in the jurisdiction where the Project is located as will protect the Contractor, his subcontractors, and the Owner from claims for bodily injury, death, or property damage which may arise

from operations under this Contract. The Contractor shall not commence work under this Contract until he has obtained all the insurance required, has filed the Certificate of Insurance with the Owner, and the Certificate has been approved by the Owner. Each insurance policy shall contain a clause providing that the insurance company shall not cancel it without written notice to the Owner of intention to cancel.

3. 11.4.2 Workmen's Compensation and Employer's Liability Insurance in statutory limits shall be secured and maintained as required by the laws of the State of Arkansas. This insurance shall cover all employees who have performed any of the obligations assumed by the Contractor under these Contract Documents including Employer's Liability Insurance. This insurance shall protect the Contractor against any and all claims resulting from injuries, sickness, disease, or death to employees engaged in work under this Contract.
4. 11.4.3 Comprehensive General Liability Insurance, including automobile and truck liability. Prior to blasting, the Contractor shall furnish Certificate of Insurance, which shall certify that damage caused by blasting is within the coverage of his Comprehensive General Liability Insurance to the full limits thereof. Hired and non-owned automobile insurance for automobiles and trucks shall include hired and non-owned automobile coverage.
5. 11.4.4 Contractor's Protective Liability Insurance: The Contractor shall indemnify and save harmless the State from and against all losses and all suits, claims, demands, judgements, actions, and payments of every description and nature brought or recovered against him by reason of any omission or act of the Contractor, his agents, or employees in the execution of the Work or in the guarding of it. The Contractor shall secure and maintain protective liability insurance in the name of the Owner and the Contractor covering them from contingent liability under this Contract.
6. 11.4.5 Builder's Risk and Fire Insurance: The Contractor shall procure and maintain, during the life of this Contract, Builder's Risk Insurance fire, lightning, extended coverage, vandalism, and property theft on the insurable portion of the Project on a 100 percent completed value basis against damage to the equipment, structures, or material. The Owner and the Contractor, as their interests may appear, shall be named as the Insured.
7. 11.4.6 Proof of Insurance: The Contractor shall maintain the insurance coverages required by this Contract (see Supplementary Conditions) throughout the term of this Contract, and shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be canceled, materially altered except after 15 days prior written notice has been received by the Owner".

H. AIA Document A201-1997, Article 11.5 - Delete and insert:

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 expenses incident 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 State Building Services, Construction Section.

b. Use proper Arkansas Statutory Performance and Payment Bond Form, provided by State Building Services.

**2.12 ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT:**

A. AIA Document A201-1997, 14.1.3 - Delete and insert:

1. 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.

**2.13 ARTICLE 14 - TERMINATION BY OWNER FOR CONVENIENCE:**

A. Revise 14.4.1, 14.4.2 and 14.4.3 to read as follows:

1. The Owner will have the right to terminate the Contract for Convenience and without cause upon given ten days written notice of the termination to the Contractor and the Contractor's surety. Once notice is received, the Contractor shall: Cease all operations as indicated by the written notice, provide for the protection and preservation of the work and terminate existing subcontractors and purchase orders upon the effective termination date as indicated in the notice and not enter into any contracts involving subcontractors or purchase orders.
2. If the contract is terminated upon the convenience of the Owner, the Contractor is entitled to receive payment for the work executed and accepted by the Owner, and the overhead profit credit amount of 7% of the work that was left to be performed in the Contract.

**2.14 MISCELLANEOUS:**

A. "All laws, rules and regulations of the State of Arkansas shall take precedence over any statements and/or inferences made in the AIA A201-1997 Document. Nothing in AIA A201-1997 shall be construed as a waiver of the State's or it's entities sovereign immunity".

**END OF SECTION**

**SECTION 00850**
**LIST OF DRAWINGS**

**PART 1 - GENERAL**

**1.1 THE FOLLOWING DRAWINGS DATED "02/17/2017 ISSUE FOR BIDS" BEARING THE ARCHITECT'S COMMISSION NUMBER 074-15 WITH THESE SPECIFICATIONS, FORM THE CONTRACT DOCUMENTS.**

**PART 2 - LIST OF DRAWINGS**

**2.1 ARCHITECTURAL / CIVIL**

T1 TITLE SHEET / CODE INFO / INDEX TO DRAWINGS
G1 GENERAL NOTES

C1 CIVIL - TOPOGRAPHIC SURVEY
C2 CIVIL - EROSION CONTROL PLAN
C3 CIVIL - OVERALL CIVIL SITE PLAN
C4 CIVIL - WEST HALF CIVIL SITE PLAN
C5 CIVIL - EAST HALF CIVIL SITE PLAN
C6 CIVIL - OVERALL GRADING PLAN
C7 CIVIL - WEST HALF GRADING PLAN
C8 CIVIL - EAST HALF GRADING PLAN
C9 CIVIL - SITE UTILITY PLAN
C10 CIVIL - SITE DETAILS
C11 CIVIL - UTILITY DETAILS
C12 CIVIL - GRADING & DRAINAGE PLAN
C13 CIVIL - GRADING & DRAINAGE PLAN
C14 CIVIL - GRADING & DRAINAGE PLAN
C15 CIVIL - GRADING & DRAINAGE PLAN

A1 GENERAL NOTES AND SCHEDULES
A2 ENLARGED FLOOR PLAN - AREA A
A3 ENLARGED FLOOR PLAN - AREA B
A4 ENLARGED FLOOR PLAN - AREA C
A5 ENLARGED FLOOR PLAN - AREA D
A6 ENLARGED FLOOR PLAN - AREA E
A7 ENLARGED FLOOR PLAN - AREA F
A8 DOOR SCHEDULE & DOOR ELEVATIONS
A9 HOLLOW METAL & ALUMINUM STOREFRONT ELEVATIONS / DETAILS
A10 WINDOW ELEVATIONS / DETAILS
A11 ENLARGED PLANS / TOILET DETAILS
A12 ENLARGED PLANS / TOILET DETAILS
A13 ENLARGED PLANS / TOILET DETAILS
A14 EAST & WEST EXTERIOR ELEVATIONS
A15 NORTH & SOUTH EXTERIOR ELEVATIONS
A16 BUILDING SECTIONS / DETAILS - VESTIBULE / TOWER
A17 BUILDING SECTIONS
A18 BUILDING SECTIONS
A19 BUILDING SECTIONS
A20 BUILDING SECTIONS
A21 BUILDING SECTIONS
A22 BUILDING SECTIONS
A23 BUILDING SECTIONS
A24 REFLECTED CEILING PLAN - ARCHITECTURAL 1 OF 2

A25 REFLECTED CEILING PLAN - ARCHITECTURAL 2 OF 2
A26 ROOF PLAN
A27 MILLWORK ELEVATIONS / DETAILS

**2.2 STRUCTURAL**

S1.1 STRUCTURAL NOTES AND SCHEDULES
S1.2 STRUCTURAL NOTES AND SCHEDULES
S1.3 BUILDING LOADS PLAN AND NOTES
S2.1 FOUNDATION PLAN - AREA 'A'
S2.2 FOUNDATION PLAN - AREA 'B'
S2.3 FOUNDATION PLAN - AREA 'C'
S2.4 FOUNDATION PLAN - AREA 'D'
S2.5 FOUNDATION PLAN - AREA 'E'
S2.6 FOUNDATION PLAN - AREA 'F'
S3.1 FOUNDATION DETAILS
S3.2 FOUNDATION DETAILS
S3.3 FOUNDATION DETAILS
S3.4 FOUNDATION DETAILS
S3.5 FOUNDATION DETAILS
S4.1 ROOF FRAMING PLAN - AREA 'A'
S4.2 ROOF FRAMING PLAN - AREA 'B'
S4.3 ROOF FRAMING PLAN - AREA 'C'
S4.4 ROOF FRAMING PLAN - AREA 'D'
S4.5 ROOF FRAMING PLAN - AREA 'E' AND FLOOR FRAMING PLAN - AREA 'F'
S4.6 ROOF FRAMING PLAN - AREA 'F'
S5.1 STRUCTURAL DETAILS
S5.2 STRUCTURAL DETAILS
S5.3 STRUCTURAL DETAILS
S5.4 STRUCTURAL DETAILS
S5.5 STRUCTURAL DETAILS
S5.6 STRUCTURAL DETAILS
S6.1 STRUCTURAL BUILDING SECTIONS
S6.2 STRUCTURAL BUILDING SECTIONS
S6.3 STRUCTURAL BUILDING SECTIONS

**2.3 MECHANICAL / PLUMBING / FIRE PROTEECTION / ELECTRICAL**

M1 OVERALL FLOOR PLAN - HVAC
M2 PARTIAL ENLARGED FLOOR PLAN AREA A - HVAC
M3 PARTIAL ENLARGED FLOOR PLAN AREA A1 - HVAC
M4 PARTIAL ENLARGED FLOOR PLAN AREA A2 - HVAC
M5 PARTIAL ENLARGED FLOOR PLAN AREA B - HVAC
M6 PARTIAL ENLARGED FLOOR PLAN AREA B1 - HVAC
M7 PARTIAL ENLARGED FLOOR PLAN AREA B2 - HVAC
M8 PARTIAL ENLARGED FLOOR PLAN AREA B3 - HVAC
M9 PARTIAL ENLARGED FLOOR PLAN AREA C - HVAC
M10 PARTIAL ENLARGED FLOOR PLAN AREA C1 - HVAC
M11 PARTIAL ENLARGED FLOOR PLAN AREA C2 - HVAC
M12 PARTIAL ENLARGED FLOOR PLAN AREA C3 - HVAC
M13 PARTIAL ENLARGED FLOOR PLAN AREA C4 - HVAC
M14 PARTIAL ENLARGED FLOOR PLAN AREA D - HVAC
M15 PARTIAL ENLARGED FLOOR PLAN AREA D1 - HVAC
M16 PARTIAL ENLARGED FLOOR PLAN AREA D2 - HVAC
M17 PARTIAL ENLARGED FLOOR PLAN AREA D3 - HVAC
M18 PARTIAL ENLARGED FLOOR PLAN AREA D4 - HVAC
M19 PARTIAL ENLARGED FLOOR PLAN AREA E - HVAC

M20 PARTIAL ENLARGED FLOOR PLAN AREA F - HVAC
M21 PARTIAL ENLARGED FLOOR PLAN AREA F1 - HVAC
M22 PARTIAL ENLARGED FLOOR PLAN AREA F2 - HVAC
M23 OVERALL ROOF PLAN - HVAC
M24 HVAC SCHEDULES
M25 HVAC SCHEDULES
M26 HVAC DETAILS
M27 HVAC DETAILS
M28 MISC. SUPPORT DETAILS

P1 OVERALL FLOOR PLAN - PLUMBING
P2 PARTIAL FLOOR PLAN - PLUMBING
P3 PARTIAL FLOOR PLAN - PLUMBING
P4 PARTIAL FLOOR PLAN - PLUMBING
P5 PARTIAL FLOOR PLAN - PLUMBING
P6 PARTIAL FLOOR PLAN - PLUMBING
P7 MEZZANINE FLOOR PLAN - PLUMBING
P8 SCHEDULES & DETAILS - PLUMBING
P9 PLUMBING DETAILS
P10 PLUMBING DETAILS
P11 PLUMBING RISER DIAGRAMS
P12 PLUMBING RISER DIAGRAMS
P13 PLUMBING RISER DIAGRAMS
P14 PLUMBING RISER DIAGRAMS

FP1 OVERALL FLOOR PLAN - FIRE PROTECTION
FP2 PARTIAL FLOOR PLAN - FIRE PROTECTION
FP3 PARTIAL FLOOR PLAN - FIRE PROTECTION
FP4 PARTIAL FLOOR PLAN - FIRE PROTECTION
FP5 PARTIAL FLOOR PLAN - FIRE PROTECTION
FP6 PARTIAL FLOOR PLAN - FIRE PROTECTION
FP7 MEZZANINE FLOOR PLAN - FIRE PROTECTION
FP8 FIRE PROTECTION DETAILS
FP9 FIRE PROTECTION DETAILS
FP10 FIRE PROTECTION DETAILS
FP11 FIRE PROTECTION DETAILS
FP12 FIRE PROTECTION DETAILS

E1 SITE PLAN - ELECTRICAL
E2 ENLARGED FLOOR PLAN AREA A - LIGHTING
E3 ENLARGED FLOOR PLAN AREA B - LIGHTING
E4 ENLARGED FLOOR PLAN AREA C - LIGHTING
E5 ENLARGED FLOOR PLAN AREA D - LIGHTING
E6 ENLARGED FLOOR PLAN AREA E - LIGHTING
E7 ENLARGED FLOOR PLAN AREA F - LIGHTING
E8 ENLARGED FLOOR PLAN AREA A - POWER
E9 ENLARGED FLOOR PLAN AREA B - POWER
E10 ENLARGED FLOOR PLAN AREA C - POWER
E11 ENLARGED FLOOR PLAN AREA D - POWER
E12 ENLARGED FLOOR PLAN AREA E - POWER
E13 ENLARGED FLOOR PLAN AREA F - POWER
E14 ENLARGED FLOOR PLAN AREA A - AUXILARY
E15 ENLARGED FLOOR PLAN AREA B - AUXILARY
E16 ENLARGED FLOOR PLAN AREA C - AUXILARY
E17 ENLARGED FLOOR PLAN AREA D - AUXILARY

E18 ENLARGED FLOOR PLAN AREA E - AUXILARY
E19 ENLARGED FLOOR PLAN AREA F - AUXILARY
E20 LEGEND AND DETAILS
E21 LIGHTING CONTROLS AND FIXTURE SCHEDULE
E22 RISER DIAGRAM AND SCHEDULES
E23 PANEL SCHEDULES
E24 PANEL SCHEDULES
E25 PANEL SCHEDULES
E26 PANEL SCHEDULES
E27 PANEL SCHEDULES AND FAULT CURRENT SCHEDULE

**END OF SECTION**

# SECTION 00860
# COLOR PLACEMENT SCHEDULE

## PART 1 - GENERAL

**1.1 THE FOLLOWING COLOR SELECTIONS ARE FOR GENERAL INFORMATION ONLY. FINAL COLOR SELECTION WILL BE BASED ON ACTUAL SAMPLES OF PRODUCTS SUBMITTED IN ACCORDANCE WITH THESE SPECIFICATIONS.**

## PART 2 - EXTERIOR AND INTERIOR COLOR PLACEMENT SCHEDULE

**2.1 NOTES:**

A. All interior and exterior equipment, RA, grilles, light fixtures, etc. to be factory finished or painted to match same as adjacent surface, unless otherwise noted.

**2.2 EXTERIOR COLOR SCHEDULE:**

SPLIT-FACE CONCRETE MASONRY UNITS: Color - Olive Stone; Company Nettleton Concrete, Inc

METAL BUILDING WALL PANELS: Color to be selected.

STANDING SEAM METAL ROOFING: Color to be selected

STOREFRONT WINDOWS AND METAL FRAME STOREFRONT DOORS: Color to be selected.

EXTERIOR DOORS AND DOOR FRAMES: Paint - Color to be selected.

METAL GUTTERS AND DOWN SPOUT SYSTEMS: Color to be selected.

EXTERIOR SIGNAGE: Color to be selected.

BOLLARDS: Painted - Color to be selected.

PAINTED: Colors to be selected. Exposed undersides of exterior roof structures including tower entry/vestibule, canopies at bus drop off, welding canopy, north elevation shade canopies (3 total), exterior support columns at tower entry, bus canopy, shade canopies and welding canopy.

All equipment, grilles, roof mounted items, etc. to be painted same as adjacent surface.

Submit samples for Architect's approval for all finishes that are to match existing or adjacent finishes.

**2.3 INTERIOR COLOR SCHEDULE - COLORS TO BE SELECTED BY ARCHITECT:**

**Note: All exposed structure is to be painted. Colors to be selected. Including but not limited to Exposed steel columns, beams, frames, exposed purlins, roof deck, and all associated items.**

Vestibule 100

| | |
|---|---|
| Floor: | Carpet - Buckthorn |
| Base: | @ South Wall |
| | Porcelain Tile - Acadia |
| Wall/Blkhd: | Paint - AC30 Winter Gates |
| South Wall: | Metal Panel - color to be selected |
| Ceiling: | OTS Painted - Winter White |
| Structural Steel: | Painted - color to be selected |
| Storefronts: | Aluminum |

Lobby 101

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| West Wall @ Reception Counter: | Painted - Metallic (Copper)<br>Large Format Tile - Brown |
| Ceiling: | OTS - Painted - Winter White |
| Bulkheads: | Painted - Winter Gates |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefronts: | Aluminum |

Corridor 102

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| North & South Wall @ 104 & "Bump": | Painted - Metallic (Copper) |
| North Recessed Wall @ 122 & 123: | Painted - Metallic (Copper) |
| Ceiling: | OTS - Painted - Winter White |
| Bulkheads: | Painted - Winter Gates |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefronts: | Aluminum |

Reception 103

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| West Wall: | Painted - Metallic (Copper)<br>Large Format Tile - Brown |
| Ceiling: | OTS - Painted - Winter White |
| Bulkheads: | Painted - Winter Gates |
| Millwork: | Laminate - Mineral Jet<br>Perforated Metal Panels<br>Solid Surface - Black Lava |

Storage 104

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Copy 105

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| North Wall: | Painted - Metallic (Copper |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stained - color to be selected |
| Millwork: | Laminate -<br>Cabinets - Elemental Corten<br>Countertops - Graphite Twill |

Conference 106

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted -Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Office 107

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Office - 108

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| West Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 109

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 110

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| West Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 111

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 112

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| West Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 113

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 114

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| West Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office - 115

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Door: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Corridor 116

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Bulkheads: | Painted - Winter Gates |

Storage 117

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Storage 118

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Storage 119

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Men 120

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | (Field) Porcelain Tile - Nightsky<br>(Border) Porcelain Tile - Acadia |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Elemental Corten |
| Toilet Partitions: | HDP - Titanium |

Telecom 121
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Men 122
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Women 123
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Women 124
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Frames: Painted - Iron Mountain
Ceiling: White - Lay In
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Janitor 125
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Storage 126
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Break 127
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Armor (Custom Color)
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate -
Cabinets - Elemental Corten
Countertops - Graphite Twill

Faculty Work 128
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Armor (Custom Color)
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Storefront: Aluminum

Office 129
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
North Wall: Painted - Winter Gates
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Door: Stain - color to be selected

Office 130
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
South Wall: Painted - Winter Gates
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Door: Stain - color to be selected

Storage 131
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

General Classroom 132
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Storefront: Aluminum

Safety Classroom / Lab 133

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Storage 133A

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Electrical Lab 134

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Storage 134A

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Electrical Classroom 135

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Corridor 136

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| North Walls @ Rms 137 & 138: | Painted - Metallic (White) |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Mechanical Lab 137

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Storage 137A

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Manufacturing Classroom 138

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Storage 138A

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Computer Classroom 139

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Storefront: | Aluminum |

Computer Lab 140

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Storage 140A

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Education Lab 141
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: OTS - Painted - Winter White
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Storefront: Aluminum
Millwork: Laminate -
Cabinets - Elemental Corten
Countertops - Graphite Twill

Storage 141A
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Vestibule 142
Floor: Carpet - Buckthorn
Base: Rubber Millwork - Black Pearl
Transition: Rubber - Black
Walls: Painted - Armor (Custom Color)
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Storefront: Aluminum

Corridor 143
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Armor (Custom Color)
Ceiling: OTS - Painted - Winter White
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Storefront: Aluminum

Office 144
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Conference 145
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate -
Cabinets - Elemental Corten
Countertop - Graphite Twill

Storage 146
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Break 147
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Winter Gates
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate -
Cabinets - Elemental Corten
Countertops - Graphite Twill

Storage 148
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Men 149
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Women 150
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Faculty 151

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| South Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office 152

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sills: | Solid Surface - Black Lava |

Office 153

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sills: | Solid Surface - Black Lava |

Office 154

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| West Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sills: | Solid Surface - Black Lava |

Office 155

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| South Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sills: | Solid Surface - Black Lava |

Office 156

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| North Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sills: | Solid Surface - Black Lava |

Office 157

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| North Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sills: | Solid Surface - Black Lava |

Faculty Work 158

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Freestanding Wall @ MW: | Painted - Metallic (Black) |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Cabinets - Elemental Corten Countertop - Graphite Twill |

Corridor 159

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| South Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Copy 160

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Winter Gates |
| Ceiling: | White - Lay |
| Millwork: | Laminate - Cabinets - Elemental Corten Countertop - Graphite Twill |

Storage 161

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Column: | Painted - Winter Gates |

Secondary Reception 162

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| East Wall: | Painted - Winter Gates |
| Freestanding | |
| Wall @ MW: | Painted - Metallic (Black) |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Vestibule 163

| | |
|---|---|
| Floor: | Carpet - Buckthorn |
| Base: | Rubber Millwork - Black Pearl |
| Transition: | Rubber - Black |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | White - Lay In |
| Storefront: | Aluminum |

Corridor 164

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Construction Carpentry Lab 165

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Wood - Stain - color to be selected |
| | Metal - Painted - Winter Gates |
| Storefront: | Aluminum |
| Window Sills: | Solid Surface - Black Lava |

Construction Carpentry Classroom 166

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Office 167

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Crime Scene Mock Up 168

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Storage 169

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Construction Storage 170

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Metal Panels |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Criminal Justice Classroom/Lab 171

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Wood - Stain - color to be selected |
| | Metal - Painted - Winter Gates |
| Storefront: | Aluminum |
| Millwork: | Laminate - |
| | Cabinets - Elemental Corten |
| | Countertop - Graphite Twill |

Vestibule 172

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | White - Lay In |
| Storefront: | Aluminum |

Corridor 173

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |
| Bulkhead: | Painted - Winter Gates |

Women 174

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | (Field) Porcelain Tile - Nightsky |
| | (Border) Porcelain Tile - Acadia |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Elemental Corten |
| Toilet Partitions: | HDP - Titanium |

Men 175

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | (Field) Porcelain Tile - Nightsky |
| | (Border) Porcelain Tile - Acadia |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Elemental Corten |
| Toilet Partitions: | HDP - Titanium |

Janitor 176

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Welding Storage 177

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Painted - Winter Gates |

Mechanical Electrical 178

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Painted - Winter Gates |

Exterior Storage 179

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Painted - Winter Gates |

Compressed Air 180

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Painted - Winter Gates |

Storage 181

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | N/A |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Painted - Winter Gates |

Storage 182

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | N/A |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |

Storage 183

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | N/A |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |

Storage 184

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | N/A |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |

Storage 185A & 185B

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | N/A |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |

Storage 186
Floor: Polished Concrete
Base: N/A
Walls: Metal Panels - color to be selected
Ceiling: OTS - Painted - Winter White
Frames: Painted - Iron Mountain
Doors: Painted - Winter Gates

Welding Lab 187
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Metal Panels - color to be selected
Ceiling: OTS - Painted - Winter White
Frames: Painted - Iron Mountain
Doors: Wood - Stain - color to be selected
Metal - Painted - Winter Gates

Storage 188
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Painted - Winter Gates

Office 189
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Painted - Winter Gates

Office 190
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Painted - Winter Gates

Office 191
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Painted - Winter Gates

Dress 192
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Lockers: Color to be selected

Women 193
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Corridor 194
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Armor (Custom Color)
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Janitor 195
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Telecom 196
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Emberts
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Men 197
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: (Field) Porcelain Tile - Nightsky
(Border) Porcelain Tile - Acadia
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate - Elemental Corten
Toilet Partitions: HDP - Titanium

Dressing 198
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Lockers: Color to be selected

Storage 199
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Ember
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

#200 Not Used

Welding Classroom 201
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Wood - Stain - color to be selected
Metal - Painted - Winter Gates
Storefront: Aluminum

Welding Classroom 202
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Painted - Winter Gates
Storefront: Aluminum

HVAC Classroom 203
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Storefront: Aluminum

Office 204
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

HVAC Lab 205
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: OTS - Painted - Winter White
Frames: Painted - Iron Mountain
Doors: Wood - Stain - color to be selected
Metal - Painted - Winter Gates
Storefront: Aluminum

HVAC Storage 206
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

General Classroom 207
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Storefront: Aluminum
Window Sills: Solid Surface - Black Lava

Lounge 208
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Armor (Custom Color)
West Wall: Metal Panels - Color to be selected
Ceiling: OTS - Painted - Winter White
Suspended Metal Panels
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Storefront: Aluminum

Break 209
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected
Millwork: Laminate -
Cabinets - Elemental Corten
Countertops - Graphite Twill

Storage 210
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Storage 211
Floor: Polished Concrete
Base: Porcelain Tile - Acadia
Walls: Painted - Smoke Embers
Ceiling: White - Lay In
Frames: Painted - Iron Mountain
Doors: Stain - color to be selected

Multipurpose/Community 212

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | OTS - Painted - Winter White Cloud - White - Lay In |
| Bulkhead: | Painted - Winter Gates |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Operable Panels: | Color to be Selected |

Corridor 213

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | White - Lay In |
| Bulkheads @ 214 &215: | Painted - Metallic (Copper) |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefronts: | Aluminum |

General Classroom 214

| | |
|---|---|
| Floor: | Carpet - Buckthorn |
| Base: | Rubber Millwork - Black Pearl |
| Transition: | Rubber - Black |
| Walls: | Painted - Winter Gates |
| South Wall: | Painted - Metallic (Copper) |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Computer Lab / Library 215

| | |
|---|---|
| Floor: | Carpet - Buckthorn |
| Base: | Rubber Millwork - Black Pearl |
| Transition: | Rubber - Black |
| Walls: | Painted - Winter Gates |
| North Wall: | Painted - Metallic (Copper) |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Men 216

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | (Field) Porcelain Tile - Nightsky<br>(Border) Porcelain Tile - Acadia |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Elemental Corten |
| Toilet Partitions: | HDP - Titanium |

Staff 217

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | (Field) Porcelain Tile - Nightsky<br>(Border) Porcelain Tile - Acadia |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Elemental Corten |
| Toilet Partitions: | HDP - Titanium |

Storage 218

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Office 219

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| South Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office 220

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| North Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Office 221

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted -Smoke Embers |
| North Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Window Sill: | Solid Surface - Black Lava |

Aviation Faculty Work 222

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| West Wall: | Painted - Winter Gates |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |

Women 223

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | (Field) Porcelain Tile - Nightsky |
| | (Border) Porcelain Tile - Acadia |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Millwork: | Laminate - Elemental Corten |
| Toilet Partitions: | HDP - Titanium |

Telecom 224

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Corridor 225

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| East Wall @ 216 & 223: | Painted - Metallic (Black) |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefronts: | Aluminum |

Aviation Classroom 226

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Storefront: | Aluminum |
| Window Sills: | Solid Surface - Black Lava |

#227 NOT USED

Mechanical / Electrical 228

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Janitor 229

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Vestibule 230

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Armor (Custom Color) |
| Ceiling: | White - Lay In |
| Storefront: | Aluminum |

Aviation Lab 231

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Metal Panels - color to be selected |
| | Exposed Insulation - White |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Mtl. Doors: | Painted - Winter Gates |
| Wood Doors: | Stain - color to be selected |
| Handrails: | Painted - Iron Mountain |
| Storefronts: | Aluminum |

Tool Storage 232

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Metal Panels - color to be selected |
| | Exposed Insulation - White |
| Ceiling: | OTS - Painted - Winter White |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Compressed Air 233

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Storage 234

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Storage 235

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Storage 236

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |

Aviation Composite Lab 237

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| | Exposed Insulation - White |
| Bulkhead: | Painted - Winter Gates |
| Frames: | Painted - Iron Mountain |
| Doors: | Stain - color to be selected |
| Storefront: | Aluminum |
| Window Sills: | Solid Surface - Black Lava |

Aviation Non-Destructive Testing Lab 238

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | OTS - Painted - Winter White |
| | Exposed Insulation - White |
| Bulkhead: | Painted - Winter Gates |
| Storefront: | Aluminum |
| Window Sills: | Solid Surface - Black Lava |

Aviation Classroom 239

| | |
|---|---|
| Floor: | Polished Concrete |
| Base: | Porcelain Tile - Acadia |
| Walls: | Painted - Smoke Embers |
| Ceiling: | White - Lay In |
| Storefront: | Aluminum |
| Window Sills: | Solid Surface - Black Lava |

Open Storage Mezzanine 240

| | |
|---|---|
| Floor: | Light Weight Concrete |
| Base: | N/A |
| Walls: | Metal Panels - color to be selected |
| Ceiling: | OTS - Painted - Winter White |
| | Exposed Insulation - White |
| Guardrails: | Painted - Iron Mountain |
| Steel Stairs: | Painted - Color to be selected |

## PART 3 - MANUFACTURER'S LIST OF MATERIALS

NOTE: Color Schedule Items must be submitted to Architect for final approval before ordering.

### 3.1 FLOORING (Also see "Tile" below):

| Color | Product | Style | Company |
|---|---|---|---|
| To be selected | Polished Concrete | | See Specifications |
| 1926 Buckthorn | Kinetex 12" x 48" Plank | Timber | J+J Flooring Group |

### 3.2 BASE / TRANSITION STRIPS (Also see "Tile" below):

| Color | Product | Style | Company |
|---|---|---|---|
| TCB-82 Black Pearl | Rubber Base | Millwork | Johnsonite |
| 40 Black | Transition Strips | Reducer | Johnsonite |

### 3.3 PAINT (WALLS, DOOR FRAMES, BULKHEADS, CEILINGS):

| Color | Product | Style | Company |
|---|---|---|---|
| AC-28 Smoke Embers | Paint | As Specified | Benjamin Moore |
| AC-30 Winter Gates | Paint | As Specified | Benjamin Moore |
| 2134-30 Iron Mountain | Paint | As Specified | Benjamin Moore |
| OC-21 Winter White | Paint | As Specified | Benjamin Moore |
| Custom Color (base/flecks) | Scuffmaster | Armor (Tri-Color) | Master Coating Tech |
| BR-011 (Copper) | Scuffmaster | Burnished Metallic | Master Coating Tech. |
| BR-036 (White) | Scuffmaster | Burnished Metallic | Master Coating Tech. |
| BR-028 (Black) | Scuffmaster | Burnished Metallic | Master Coating Tech. |

### 3.5 TILE (WALLS, BASE):

| Color | Product | Style | Company |
|---|---|---|---|
| Acadia (Black) | 6" x 24" Porcelain Tile | Parkland Collection | StonePeak |
| Nightsky (Grey) | 6" x 24" Porcelain Tile | Sky Collection | StonePeak |
| L5689 Brown | Large Format Porcelain | Urban Influence-Satori | Crossville |

### 3.6 STAIN (DOORS):

| Color | Product | Style | Company |
|---|---|---|---|
| Colors to be Selected | Stain | | Pratt & Lambert |

### 3.8 CEILING (ACOUSTICAL TILE):

| Color | Product | Style | Company |
|---|---|---|---|
| White | Coretga | Square Lay-In | Armstrong |

### 3.9 PLASTIC LAMINATE, SOLID SURFACES (MILLWORK/WINDOW SILLS):

| Color | Product | Style | Company |
|---|---|---|---|
| 8832-58 Elemental Corten | Plastic Laminate | | Formica |
| 8829-58 Graphite Twill | Plastic Laminate | | Formica |
| 3450-RD Mineral Jet | Plastic Laminate | | Formica |
| 501 Black Lava | Solid Surface | | Formica |

### 3.9.1 MISCELLANEOUS:

| Color | Product | Style | Company |
|---|---|---|---|
| To be selected | Wall and floor grout | | Laticrete |
| 242 Titanium | Toilet Partitions | | General Partitions |
| To be selected | Electrical Cover Plates | | |
| To be selected | Operable Wall Panels | | Hufcor, Inc |
| Painted - To be selected | Bi-Fold Door (Framing) | | |

NOTE: All interior and exterior equipment, RA grilles, light fixtures, etc. to be factory finished or painted to match same as adjacent surface, unless otherwise noted.

**END OF SECTION**

# SECTION 01100
# SUMMARY

## PART 1 - GENERAL

### 1.1 PROJECT

A. Project Name: Arkansas Northeastern College New Center for Allied Technologies, Blytheville, Arkansas

B. Owner's Name: Arkansas Northeastern College, Blytheville, Arkansas

C. Architect's Name: A. C. Williams, Architect

D. The Project consists of work including site work, slab on grade, pre-engineered metal building structure, metal wall panel exterior, modified bitumen and standing seam metal roofs, mechanical, plumbing, electrical and fire protection systems for a new, approximately 87,000 s.f. classroom building serving vocational and industrial training programs.

### 1.2 CONTRACT DESCRIPTION:

A. Contract Type: A single prime contract based on a lump sum as described in Document 00500 - Agreement.
   1. Owner reserves the right to award additional contracts.

### 1.3 WORK BY OWNER:

A. Items noted NIC (Not In Contract) will be supplied by the Owner and may, at the option of the Owner, be installed by Owner before or shortly after Substantial Completion.

### 1.4 OWNER OCCUPANCY:

A. The Owner intends to continue to occupy adjacent existing buildings during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

### 1.5 CONTRACTOR USE OF SITE AND PREMISES:

A. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.

B. Emergency Building Exits during Construction: Keep all exits required by code open during construction period.

C. Contractor shall coordinate with Owner and Architect to phase the Work if necessary in order to maintain accessibility to the existing building(s). Temporary closures shall be scheduled with

Owner and Local Emergency Services.

D. General Contractor shall maintain access to the existing building including access by the physically disabled.

**PART 2 - PRODUCTS - NOT USED**

**PART 2 - EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01200
# PRICE AND PAYMENT PROCEDURES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Procedures for preparation and submittal of applications for progress payments.

B. Change procedures.

C. Procedures for preparation and submittal of application for final payment.

### 1.2 RELATED SECTIONS:

A. Document 00500 - Agreement: Contract Price.

B. Document 00700 - General Conditions and Document 00800 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.

### 1.3 SCHEDULE OF VALUES:

A. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet.

B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section.. Identify site mobilization.

D. Revise schedule to list approved Change Orders, with each Application for Payment.

### 1.4 APPLICATIONS FOR PROGRESS PAYMENT:

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Present required information in typewritten form.

C. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet when required.

D. For each item, provide a column for listing each of the following:
1. Item Number
2. Description of work.
3. Scheduled Values
4. Previous Applications.
5. Work in Place and Stored Materials under this Application.
6. Authorized Change Orders.
7. Total Completed and Stored to Date of Application.
8. Percentage of Completion.
9. Balance to Finish.
10. Retainage.

E. Execute certification by signature of authorized officer.

F. Submit three copies of each Application for Payment.

G. Include the following with the application:
1. Transmittal letter as specified for Submittals in Section 01300.
2. Construction progress schedule, revised and current as specified in Section 01300.
3. Partial release of liens from major Subcontractors and vendors.
4. Affidavits attesting to off-site stored products.

H. When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

## 1.5 MODIFICATION PROCEDURES

A. The Architect/Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on AIA Form G710.

B. Construction Change Directive: Architect/Engineer may issue a document, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The document will describe changes in the Work, and will designate method of determining any change in Contract Sum or Contract Time.
2. Promptly execute the change in Work.

C. Proposal Request: The Architect/Engineer may issue a document which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.

D. Computation of Change in Contract Amount:
1. For change requested by Architect/Engineer for work falling under a fixed price contract, the amount will be based on Contractor's prove quotation.
2. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.

E. Substantiation of Costs: Provide full information required for evaluation.
1. On request, provide the following:
   a. Quantities of products, labor, and equipment.
   b. Taxes, insurance and bonds.
   c. Overhead and profit.
   d. Justification for any change in Contract Time.
   e. Credit for deletions from Contract, similarly documented.
2. Support each claim for additional costs with additional information.
   a. Origin and date of claim.
   b. Dates and times work was performed, and by whom.
   c. Time records and wage rates paid.
   d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
3. For time and material work, submit itemized account and supporting data after

completion of change, within time limits indicated in the Conditions of the Contract.

F. Execution of Change Orders: Architect/Engineer will issue Change Order for signatures of parties as provided in the Conditions of the Contract on AIA G701.

G. After execution of Change Order, promptly revise Schedule of Values and Application for payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

H. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

I. Promptly enter changes in Project Record Documents.

**1.6 APPLICATION FOR FINAL PAYMENT:**

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01700.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01300
# SUBMITTALS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Preconstruction meeting.

B. Progress meetings.

C. Construction progress schedule.

D. Submittals for review, information, and project closeout.

E. Number of copies of submittals.

F. Submittal procedures.

### 1.2 RELATED SECTIONS:

A. Document 00700 - General Conditions: Dates for applications for payment.

B. Section 01100 - Summary: Occupancy, Contractor use of site and premises.

C. Section 01700 - Execution Requirements: Additional coordination requirements.

D. Section 01780 - Closeout Submittals: Project record documents.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION

### 3.1 PRECONSTRUCTION MEETING:

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

B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor.

C. Agenda:
1. Execution of Owner-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties in the Contract including the Owner, the Contractor and the Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

**3.2 PROGRESS MEETINGS:**

A. Schedule and administer meetings throughout progress of the Wok at maximum bi-monthly intervals.

B. Attendance Required: Job Superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.

C. 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. Maintenance of progress schedules.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

**3.3 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 01325:**

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

**3.4 SUBMITTALS FOR REVIEW:**

A. When the following are specified in individual sections, submit them for review:
1. Product Data.
2. Shop Drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - Closeout Submittals.

## 3.5 SUBMITTALS FOR INFORMATION:

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

## 3.6 SUBMITTALS VERIFYING CONTRACTOR'S QUALIFICATIONS AND LICENSE:

A. Submit "Photocopy of the roofing membrane manufacturer's current and valid 'Approved Applicator's Certificate (Refer to Section 07515, Part 1)".

B. Submit any additional qualifications / certificates as required in each individual specification section.

## 3.7 SUBMITTALS FOR PROJECT CLOSEOUT:

A. When the following are specified in individual sections, submit them at project closeout:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated by these specifications or as required by Arkansas State Building Services.

B. Submit for Owner's benefit during and after project completion.

## 3.8 NUMBER OF COPIES OF SUBMITTALS:

A. Documents for review:
1. Small Size Sheets, not larger than 8-1/2 x 11 inches: Submit the number of copies which the Contractor requires, plus one copy which will be retained by the Architect.
2. Larger Sheets, not larger than 36 x 48 inches: Submit the number of opaque reproductions which Contractor requires, plus on copy which will be retained by Architect.

B. Documents for Information: Submit two copies.

C. Documents for Project Closeout: Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.

D. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

**3.9 SUBMITTAL PROCEDURES:**

A. Transmit each submittal with AIA Form G810.

B. Sequentially number the transmittal form. Review submittals with original number and a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.

E. Deliver submittals to Architect at business address.

F. Schedule submittals to expedite the Project and coordinate submission of related items.

G. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

I. Provide space for Contractor and Architect review stamps.

J. When reviewed for resubmission, identify all changes made since previous submission.

K. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

L. Submittals not requested will not be recognized or processed.

**END OF SECTION**

# SECTION 01325
# CONSTRUCTION PROGRESS SCHEDULE

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

### 1.2 RELATED SECTIONS:

A. Section 01100 - Summary: Work sequence.

### 1.3 SUBMITTALS:

A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

### 1.4 SCHEDULE FORMAT:

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

B. Diagram Sheet Size: Maximum 22 x 17 inches or width required.

C. Sheet Size: Multiples of 8-1/2 x 11 inches.

D. Scale and Spacing: To allow for notations and revisions.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION

### 3.1 PRELIMINARY SCHEDULE:

A. Prepare preliminary schedule in the form of a horizontal bar chart.

### 3.2 CONTENT:

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number

C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

D. Provide legend for symbols and abbreviations used.

**3.3 BAR CHARTS:**

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

**3.4 REVIEW AND EVALUATION OF SCHEDULE:**

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

**3.5 UPDATING SCHEDULE:**

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

**3.6 DISTRIBUTION OF SCHEDULE:**

A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

**END OF SECTION**

# SECTION 01400
# QUALITY REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Reference and standards.

B. Quality assurance submittals.

C. Mock-ups.

D. Control of installation.

E. Tolerances.

F. Testing and inspection and Testing Services.

G. Manufacturer's field services.

### 1.2 REFERENCES

A. Conform to reference standard by date of issue on date of Contract Documents.

B. Obtain copies of standards when required by Contract Documents.

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

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

E. ASTM C 1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 1997.

F. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 1998.

G. 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; 1999c.

H. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction; 1998a.

I. ASTM E 543 - Standard Practice for Agencies Performing Nondestructive Testing; 1999.

J. ASTM E 548 - Standard Guide for General Criteria used for Evaluating Laboratory Competence; 1994.

### 1.3 SUBMITTALS:

A. Design Data: Submit for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

B. Test Reports: After each test/inspection, promptly submit tow copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. project title and number.
      c. name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.
   2. Test reports are submitted for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

## 1.4 REFERENCES AND STANDARDS:

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date issue current on date of Contract Documents, except where a specific date is established by applicable code.

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

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relation ship, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

**1.5 TESTING AND INSPECTION AGENCIES:**

A. Employment of agency in no way relieves any individual Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

B. Contractor employed Agency:
1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 548, ASTM E 543, ASTM C 1021, ASTM C 1077, ASTM C 1093, and ASTM C 1021.
2. Inspection agency: Comply with requirements of ASTM D 290.
3. Laboratory: Authorized to operate in the State in which Project is located.
4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
5. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.1 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 manufacturer's instructions, including each step in sequence.

C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

**3.2 TOLERANCES:**

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

**3.3 TESTING AND INSPECTION:**

A. 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. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the Work.

C. Contractor 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 and to manufacturer's facilities.
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 by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by

the same agency on instructions by Architect. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Price.

**3.4 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 equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

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

**3.5 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 01450
# SPECIAL INSPECTIONS

## PART 1 - GENERAL

### 1.1 WORK INCLUDED:

A. Unless not required per permissible exceptions as listed in 2012 Arkansas Fire Prevention Code, Vol. II the Owner will pay for all inspections and testing as required by the 2012 Arkansas Fire Prevention Code referred to as Special Inspections. A copy of Arkansas Special Inspections and Tests requirements may be obtained from the Architect upon request.

### 1.2 RELATED WORK:

A. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities. See General Conditions of the Contract included in this specification.

B. See Specific Sections in this Specifications:
   1. Certification of Products
   2. Test, adjust and balance of equipment
   3. Laboratory tests required, and standards for testing

### 1.3 QUALITY ASSURANCE:

A. The Special Inspector shall meet one of the minimum qualifications as listed for the applicable category of testing and inspection in accordance with the "Minimum Qualifications for Special Inspectors".

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION

### 3.1 SPECIAL INSPECTORS RESPONSIBILITIES:

A. The Special Inspectors shall:
   1. Schedule and manage a Pre-Construction Meeting for Special Inspections.
      a. The roles and responsibilities of the parties shall be discussed (see Arkansas Special Inspection Guidelines - Special Inspection Responsibilities).
   2. Notify the contractor of their presence and responsibilities at the job site.
   3. Observe assigned work for which they are responsible for conformance with the plans and specifications.
   4. Report non-conforming items to the immediate attention of the contractor and the (RDPRC) Registered Design Professional In Responsible Charge. After the RDPRC's review the Contractor shall make corrections as required.
   5. Using approved form(s) write a discrepancy notice about each non-conforming item containing:
      a. A description and exact location.
      b. Reference to applicable drawings and specifications.
      c. Resolution or corrective action taken and the date.
   6. Using approved form(s0 provide timely reports and furnish these reports directly to the Design Professional and the Contractor. The report should:
      a. Describe the special inspection and tests made, with locations.
      b. Indicate non-conforming items and their resolution.

c. List unresolved items and parties notified.
d. Itemize any changes authorized by the Design Professional.

7. Furnish interim reports to the Building Official and Design Professional at the frequency indicated on the "Statement of Special Inspections".
8. Initial and date the "Date Completed" box in the Schedule of Special Inspections Services as the inspection and testing activities are completed.
9. Submit a signed "Final Report of Special Inspections" stating that all required special inspections and testing were fulfilled and reported and that any outstanding discrepancies have been corrected..

**END OF SECTION**

# SECTION 01500
# TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Temporary utilities.

B. Temporary telephone and facsimile service.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers, enclosures, and fencing.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

### 1.2 RELATED SERVICES:

A. Section 01510 - Temporary Utilities.

B. Section 01550 - Vehicular Access and Parking.

C. Section 01565 - Security Measures.

### 1.3 TEMPORARY UTILITIES - SECTION 01510:

A. Contractor may make arrangements for use of existing water utilities required for construction purposes.

B. Refer to Section 01510 - Temporary Utilities for electrical.

B. Do not use existing toilet facilities.

### 1.4 TELEPHONE SERVICE:

A. Provide, maintain, and pay for telephone, facsimile, and email service to maintain project coordination between all parties.

### 1.5 TEMPORARY SANITARY FACILITIES:

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Use of existing facilities is not permitted.

C. Maintain daily in clean and sanitary condition.

D. At end of construction, remove facilities.

### 1.6 BARRIERS:

A. Contractor to provide the following based upon requirements agreed to at the time of the pre-construction meeting.

B. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

C. Provide barricades, walkways, and walkway covers, required by governing authorities, codes, and to provide continued safe entry and exit access of the existing building and campus areas to remain in use during construction. Temporary walkways, etc. shall be designed and constructed to maintain accessibility by both able bodied individuals and individuals with disabilities per ADAAG Regulations.

D. Provide protection for plants and trees designated to remain. Replace damaged plants and trees with same type, quality size and numbers.

E. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

**1.7 FENCING:**

A. Construction: Contractor's option as to type with Owner's/Architect's approval.

B. Provide fence around construction site as required by applicable regulatory agencies and/or Owner to protect from unauthorized entry to construction site/areas; equip with vehicular and pedestrian gates with locks as necessary.

**1.8 TEMPORARY ENCLOSURES:**

A. Provide temporary partitions and ceilings as indicated and where required to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture to Owner-occupied areas, to prevent damage to existing materials and equipment, and to protect building users safety.

B. Construction: Framing and reinforced polyethylene sheet materials with closed joints and sealed edges at intersections with existing surfaces.

**1.9 SECURITY - SEE SECTION 01565:**

A. Provide security and facilities to protect Work, and Owner's operations from unauthorized entry, vandalism, or theft.

B. Coordinate with Owner's security program.

**1.10 VEHICULAR ACCESS AND PARKING:**

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Temporary parking areas to accommodate construction personnel shall be coordinated with Owner and Architect. When site space is not adequate, provide additional off-site parking.

E. Existing parking areas may be used for construction parking only as allowed by the Owner.

1. Any damage to existing parking areas and roads will be replaced or repaired to not less than the condition that existed prior to damage occurring as deemed necessary by the Architect and or the Owner. Patching will not be allowed.

F. Photographs will be taken by the Owner and or Architect prior to start of construction to be used as an aid in establishing the existing conditions of the surrounding site, buildings, roads and parking areas. These photographs will be used, should there be any disputes as to damages caused to the Owner's property during the course of construction, as an aid in determining the level or responsibility that the Contractor has in repairing damages.

**1.11 WASTE REMOVAL:**

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition. Owner's existing trash/waste containers are not to be used.

B. Provide containers with lids. Dispose of waste off-site periodically, but not less than weekly.

C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

**1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS:**

A. Remove temporary utilities, equipment, facilities, materials prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01510
# TEMPORARY UTILITIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Temporary Utilities: Electricity, lighting, heat, ventilation, and water.

### 1.2 RELATED SECTIONS:

A. Section 01500 - Temporary Facilities and Controls: Telephone service for administrative purposes.

### 1.3 TEMPORARY ELECTRICITY:

A. Provide power service required. Contractor is to make arrangements with local electrical and/or service provider to provide and pay for Owner electrical power service utilizing Owner provided electrical connection junction provided for the purpose of construction of this project. Temporary electrical connection point located immediately south of new building foot print. Field verify prior to bidding. Contractor to be responsible for coordinating with Owner.

B. Complement existing power service capacity and characteristics as required. Cost by Contractor.

C. Provide temporary power outlets, main service disconnect and over-current protection at convenient location for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

D. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

E. All temporary electrical to meet applicable safety codes and regulations.

### 1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES:

A. Provide and maintain lighting for construction operations to achieve a minimum lighting level of 2 watt/sq. ft.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

### 1.5 TEMPORARY WATER SERVICES:

A. Provide water service required. Contractor may use Owner's existing water service and is responsible for coordinating with Owner to provide for temporary water used during construction.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.

D. Exercise measures to conserve water.

E. Extend branch piping with outlets located so water is available by hoses with threaded connections.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION - NOT USED**

**END OF SECTION**

# SECTION 01525
# FIELD OFFICES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Temporary field offices for use of Contractor.

### 1.2 RELATED SECTIONS:

A. Section 01100 - Summary: Use of premises and responsibility for providing field offices.

B. Section 01500 - Temporary Facilities and Controls: Temporary sanitary facilities, temporary telephone service, and temporary facsimile service.

### 1.3 USE OF EXISTING FACILITIES:

A. Existing facilities shall not be used for field offices.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, EQUIPMENT, FURNISHINGS

A. New or used, adequate for required purposes.

### 2.2 CONSTRUCTION:

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.

C. Fire Extinguishers: Appropriate type fire extinguisher at each office.

### 2.3 ENVIRONMENTAL CONTROL:

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfortable conditions.

### 2.4 CONTRACTOR OFFICE AND FACILITIES:

A. Size: For Contractor's needs and to provide space for project meetings.

B. Telephone: As specified in Section 01500.

C. Equipment: Six adjustable band protective helmets for visitors, one 10 inch outdoor weather thermometer.

## PART 3 - EXECUTION

### 3.1 PREPARATION:

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

**3.2 INSTALLATION:**

A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

**3.3 MAINTENANCE AND CLEANING:**

A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.

B. Maintain approach walks free of mud, water, and snow.

**3.4 REMOVAL**

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

**END OF SECTION**

# SECTION 01550
# VEHICULAR ACCESS AND PARKING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Construction parking controls.

E. Flag persons.

F. Haul routes.

G. Traffic signs and signals.

H. Maintenance.

I. Removal and repair.

J. Mud from site vehicles.

### 1.2 RELATED SECTIONS:

A. Section 01100 - Summary: access to site, work sequence and occupancy.

## PART 2 - PRODUCTS

### 2.1 MATERIALS:

A. Temporary Construction: Contractor's option.

### 2.2 SIGNS, SIGNALS AND DEVICES:

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01580.

B. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

## PART 3 - EXECUTION

### 3.1 PREPARATION:

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

### 3.2 ACCESS ROADS:

A. Use of designated existing on-site streets and driveways to construction traffic is permitted.

B. Extend and relocate as Work progress requires, provide detours as necessary for unimpeded traffic flow.

C. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

D. Provide and maintain access to fire hydrants free of obstructions.

**3.3 PARKING:**

A. Permission to use designated areas of existing parking facilities by construction personnel will be determined by the Owner.

B. Do not allow heavy vehicles or construction equipment on existing drives or parking areas.

C. When site space is not adequate, provide additional off-site parking.

**3.4 CONSTRUCTION PARKING CONTROL:**

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking in non-designated areas.

**3.5 FLAG PERSONS:**

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic areas.

**3.6 HAUL ROUTES:**

A. Confine construction traffic to designated haul routes.

B. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

**3.7 TRAFFIC SIGNS AND SIGNALS:**

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocate as Work progresses to maintain effective traffic control.

**3.8 MAINTENANCE:**

A. Maintain traffic and parking areas in a sound condition, free of excavated materials, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified condition.

**3.9 REMOVAL, REPAIR:**

A. Repair existing facilities, damaged by use, to original condition.

B. Remove equipment and devices when no longer required.

C. Repair damage caused by installation.

**3.10 MUD FROM SITE VEHICLES:**

A. Provide means of removing mud from vehicle wheels before entering streets.

**END OF SECTION**

# SECTION 01565
# SECURITY MEASURES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Security measures including formal security program and entry control.

### 1.2 RELATED SECTIONS:

A. Section 01100 - Summary: Use of premises and occupancy.

B. Section 01500 - Temporary Facilities and Controls: Temporary Lighting.

### 1.3 SECURITY PROGRAM:

A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.

B. Initiate program in coordination with Owner's existing security system at project mobilization.

C. Maintain program throughout construction period until Owner occupancy.

### 1.4 ENTRY CONTROL:

A. Restrict entrance of persons and vehicles into Project site and existing facilities.

B. Allow entrance only to authorized persons with proper identification.

C. Maintain log of workers and visitors, make available to Owner on request.

D. Owner will control entrance of persons and vehicles related to Owner's operations.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION - NOT USED

**END OF SECTION**

# SECTION 01600
# PRODUCT REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. General product requirements.

B. Transportation, handling, storage and protection.

C. Product option requirements

D. Substitution limitations and procedures.

E. Spare parts and maintenance materials.

### 1.2 RELATED SECTIONS:

A. Document 00200 - Instructions to Bidders: Product options and substitution procedures prior to bid date.

B. Section 01400 - Quality Requirements: Product quality monitoring.

### 1.3 SUBMITTALS:

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standards data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, texture, and patterns.

E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS:

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

B. Provide interchangeable components of the same manufacture for components being replaced.

## 2.2 PRODUCT OPTIONS:

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

## 2.3 SPARE PARTS AND MAINTENANCE PRODUCTS:

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

# PART 3 - EXECUTION

## 3.1 SUBSTITUTION PROCEDURES:

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.

B. Architect will consider requests for substitutions only when they comply with requirements set forth in Instructions to Bidders.

C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor and Contractor shows evidence that attempt to obtain product was made in a timely fashion after award of contract.

D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

E. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Will provide the same warranty for the substitution as for the specified product.
   3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with not additional cost to Owner.
   4. Waives claims for additional costs or time extension which may subsequently become apparent.
   5. Will reimburse Owner and Architect for review or redesign services associated with reapproval by authorities.

F. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents, or when request fails to meet time constraints in Instructions to Bidders.

G. Substitution Submittal Procedure:
   1. Substitutions will not be considered if product does not offer the same, or very similar

options, as determined by the Architect, that match specified product features including, but not limited to material, profile, finish, color, texture, pattern, etc. where applicable.

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. All supporting data to be provided in a clear and direct written "side-by-side" comparison of specified products with proposed product for substitution.
4. Substitutions will not be considered if data proposed product only is submitted without comparison specified product.
5. The Architect will notify Contractor in writing and/or email of decision to accept or reject request.

**3.2 TRANSPORTATION AND HANDLING:**

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.

**3.3 STORAGE AND PROTECTION:**

A. Store and protect products in accordance with manufacturer's 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.

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.

**END OF SECTION**

# SECTION 01700
# EXECUTION REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Examination, preparation and general installation procedures.

B. Pre-installation meetings.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Starting of systems and equipment.

G. Demonstration and instructions of Owner personnel.

H. Closeout procedures, except payment procedures.

### 1.2 RELATED SECTIONS:

A. Section 01300 - Submittals.

B. Section 01400 - Quality Requirements: Testing and inspection procedures.

C. Section 01500 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

F. Section 07840 - Firestopping.

G. Individual Product Specification Sections:
   1. Advance notification to other sections of openings required in work of those sections.
   2. Limitations on cutting structural members.

### 1.3 SUBMITTALS:

A. Survey Work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

B. Cutting and Patching: Submit written request in advance of cutting or alteration which affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.

4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
   a. Identification of Project.
   b. Location and description of affected work.
   c. Necessity for curing or alteration.
   d. Description of proposed work and Products to be used.
   e. Effect on work of Owner or separate Contractor.
   f. Written permission of affected separate Contractor.
   g. Date and time work will be executed.

## 1.4 QUALIFICATIONS:

A. For survey work employ a land surveyor registered in the State in which the Project is located and acceptable to the Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

B. For field engineering employ a professional engineer of the discipline required for specific service on the project, licensed in the State in which the Project is located.

## 1.5 PROJECT CONDITIONS:

A. Grade site to drain. Maintain excavation free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

E. Erosion and Sediment Control: Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

I. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

## 1.6 COORDINATION:

A. Coordinate work of alterations and renovations to expedite completion sequentially and to accommodate occupancy requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up or work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

## PART 2 - PRODUCTS

### 2.1 PATCHING MATERIALS:

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any purposed change in materials, submit requests for substitution described in Section 01600.

## PART 3 - EXECUTION

### 3.1 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 demolition is complete in alterations areas and areas are ready for installation of new work.

C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

D. Examine and verify specific conditions described in individual specification sections.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

## 3.2 PREPARATION:

A. Cut, move or remove items as necessary for access to alterations and renovation work. Replace and restore at completion.

B. Remove unsuitable materials not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.

C. Remove debris and abandoned items from area and from concealed spaces.

D. Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate ducts and piping to prevent condensation in exposed areas.

E. Prepare surfaces and remove surface finishes to provide for proper installation of new work and finishes.

F. Clean substrate surfaces prior to applying next material or substance.

G. Seal cracks or openings of substrate prior to applying next material or substance.

H. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

## 3.3 PREINSTALLATION MEETINGS:

A. When required in individual specifications sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four 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 days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

## 3.4 LAYING OUT THE WORK:

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize recognized engineering survey practices.

H. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

I. Periodically verify layouts by same means.

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

## 3.5 GENERAL INSTALLATION REQUIREMENTS:

A. Install Products as specified in individual sections.

B. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new Work abuts or aligns with existing, perform a smooth and even transition.

C. When existing finished surfaces are cut so that a smooth transitions with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.

D. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

E. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect to review and request instructions.

F. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

G. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

H. Re-cover and refinish work that exposes mechanical and electrical work exposed accidentally during the work.

## 3.6 CUTTING AND PATCHING:

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement

adjacent work, and to fit products together to integrate with other work.

B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

C. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fie work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling or floor construction , completely seal voids with fire rated materials in accordance with Section 07840, to full thickness of the penetrated element.

H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

I. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

## 3.7 PROGRESS CLEANING:

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

## 3.8 PROTECTION OF NEWLY INSTALLED WORK AND EXISTING TO REMAIN WORK:

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

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

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

**3.9 STARTING SYSTEMS:**

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect and Owner 2 days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturer's instructions.

G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

**3.10 DEMONSTRATION AND INSTRUCTION:**

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

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

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner personnel.

**3.11 ADJUSTING:**

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

B. Testing, adjusting, and balancing HVAC systems: See appropriate Section(s) located in Division 15000 and 01400.

**3.12 FINAL CLEANING:**

A. Execute final cleaning prior to final project assessment:
1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and

foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

## 3.13 CLOSEOUT PROCEDURES:

A. Make submittals that are required by governing or other authorities.
1. Provide copies to Architect and Owner.

B. Notify Architect when work is considered ready for Substantial Completion.

C. 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.

D. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.

E. Notify Architect when work is considered finally complete.

F. Complete items of work determined by Architect's final inspection.

**END OF SECTION**

# SECTION 01780
# CLOSEOUT SUBMITTALS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Project Record Drawings.

B. Operation and Maintenance Data.

C. Warranties and Bonds.

### 1.2 RELATED SECTIONS:

A. Conditions of the Contract: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01300 - Submittals: Submittals procedures, shop drawings, product data and samples.

C. Section 01700 - Execution Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

### 1.3 SUBMITTALS:

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment. Final Payment of retainage will not be made to Contractor until Record Documents have been submitted and approved by Architect and Owner.

B. Operation and Maintenance Data:
1. Submit two copies of preliminary draft of purposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
3. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
4. Submit two sets of revised final documents in final form within 10 day after final inspection.

C. Warranties and Bonds:
1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 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 period.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION

### 3.1 PROJECT RECORD DOCUMENTS:

A. Maintain on-site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate form documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer's name and product model number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract Drawings.

### 3.2 OPERATION AND MAINTENANCE DATA:

A. For Each Product or System: List names, addresses, and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporate manufacturer's instructions.

### 3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES:

A. For each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.

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

### 3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS:

A. For each Item of Equipment and Each System:

1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

C. Include color coded wiring diagrams as installed.

D. 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.

E. 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.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.

H. Include sequence of operation by controls manufacturer.

I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

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

## 3.5 OPERATION AND MAINTENANCE MANUALS:

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

B. Prepare data in the form of an instructional manual.

C. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic, covers, 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data or typewritten data on 24 pound paper.

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

H. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

I. Contents; Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specifications section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the followings:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for special 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.

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

K. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

**3.6 WARRANTIES AND 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. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.

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

C. Co-execute submittals when required

D. Retain warranties and bonds until time specified for submittal.

E. Include originals of each in operation and maintenance manuals, indexed separately on Table of Contents.

**3.7 RELEASE OF LIENS AND CONSENT OF SURETY:**

A. Submit Release of Lien forms for all applicable sub-contractors, suppliers, etc. and consent of surety.

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

C. Co-execute submittals when required.

**END OF SECTION**

SECTION 02000

**EROSION CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

A. EROSION CONTROL DOCUMENTS ARE INCLUDED. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO KEEP THE PROJECT IN COMPLIANCE..

# Stormwater Pollution Prevention Plan (SWPPP) for Construction Activity

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

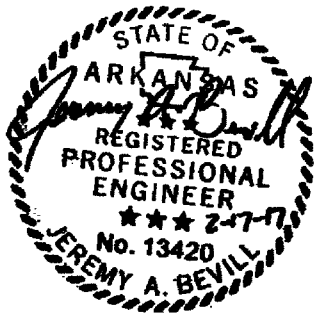
Prepared for:

ANC

Blytheville, Arkansas

Date:

2-17-2017




Prepared by:

Fisher Arnold

Revised date: 02/14/2012

Project Name and Location: ANC Allied Technologies - Blytheville, AR

Property Parcel Number (*Optional*):Click here to enter the property parcel number.

Operator Name and Address: ANC – 2501 South Division Street, Blytheville, AR 72315

A. Site Description
   a. Project description, intended use after NOI is filed:
      Educational Facility, Parking, Utilities, Drainage.
   b. Sequence of major activities which disturb soils:
      Installation of BMP's, Vegetation Removal, Demolition, Earthwork & Grading
   c. Total Area:20 Disturbed Area:14
   d. Soils Information:
      i. Runoff Coefficient Pre-Construction (See Appendix A):0.40
      ii. Runoff Coefficient Post-Construction (See Appendix A):0.80
      iii. Describe the soil or the quality of any discharge from the site: Dispersive soils are present on the site.

B. Responsible Parties

| Individual/Company | Phone Number | Service Provided for SWPPP (i.e., Inspector, SWPPP revisions, Stabilization Activities, BMP Maintenance, etc.) |
|---|---|---|
| To be determined | | SWPPP Map Revisions |
| | | SWPPP Inspections |
| | | Stabilization Activities |
| | | BMP Maintenance |
| | | Documentation Retention |

C. Receiving Waters
   a. The following waterbody (or waterbodies) receives stormwater from this construction site: Unnamed Tributary to #36 Ditch, thence into #36 Ditch.
   b. Is the project located within the jurisdiction of an MS4? ☒Yes ☐No
      i. If yes, Name of MS4: City of Blytheville
   c. Ultimate Receiving Water:

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

D. Documentation of Permit Eligibility Related to the 303(d) list and Total Maximum Daily Loads (TMDL) (http://www.adeq.state.ar.us/water/branch_planning/default.htm)

a. Does the stormwater enter a waterbody on the 303(d) list or with an approved TMDL? ☒Yes ☐No
b. If yes:
    i. Waterbody identified on 303(d) list: St. Francis River
    ii. Pollutant addressed on 303(d) list or TMDL: Chlorides
    iii. This specific project or generally construction activity is identified on 303(d) list or associated assumptions and allocations identified in the TMDL for the discharge: ☐Yes ☒No
    iv. Additional controls implemented: N/A

E. Attainment of Water Quality Standards After Authorization
    a. The permittee must select, install, implement, and maintain BMPs at the construction site that minimize pollutants in the discharge as necessary to meet applicable water quality standards. In general, except in situations explained below, the SWPPP developed, implemented, and updated to be considered as stringent as necessary to ensure that the discharges do not cause or contribute to an excursion above any applicable water quality standard.
    b. At any time after authorization, the Department may determine that the stormwater discharges may cause, have reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. If such a determination is made, the Department will require the permittee to:
        i. Develop a supplemental BMP action plan describing SWPPP modifications to address adequately the identified water quality concerns and submit valid and verifiable data and information that are representative of ambient conditions and indicate that the receiving water is attaining water quality standards; or
        ii. Cease discharges of pollutants from construction activity and submit an individual permit application.

    I understand and agree to follow the above text regarding the attainment of water quality standards after authorization. ☒Yes ☐No

F. Site Map Requirements (Attach Site Map):
    a. Pre-construction topographic view;
    b. Direction of stormwater flow (i.e., use arrows to show which direction stormwater will flow) and approximate slopes anticipated after grading activities;
    c. Delineate on the site map areas of soil disturbance and areas that will not be disturbed under the coverage of this permit;
    d. Location of major structural and nonstructural controls identified in the plan;

e. Location of main construction entrance and exit;
f. Location where stabilization practices are expected to occur;
g. Locations of off-site materials, waste, borrow area, or equipment storage area;
h. Location of areas used for concrete wash-out;
i. Location of all surface water bodies (including wetlands);
j. Locations where stormwater is discharged to a surface water and/or municipal separate storm sewer system if applicable,
k. Locations where stormwater is discharged off-site (should be continuously updated);
l. Areas where final stabilization has been accomplished and no further construction phase permit requirements apply.

G. Stormwater Controls
   a. Initial Site Stabilization, Erosion and Sediment Controls, and Best Management Practices:
      i. Initial Site Stabilization:
      Disturbance to install BMP's.
      ii. Erosion and Sediment Controls:
      Silt Fence, Construction Entrance, Rip Rap, Vegetative Buffer, Rip Rap Outlet Protection, Inlet Traps, Straw Wattles.
      iii. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the operator will replace or modify the control for site situations: ☒Yes ☐No
      If No, explain: Click here to enter explanation.
      iv. Off-site accumulations of sediment will be removed at a frequency sufficient to minimize off-site impacts: ☒Yes ☐No
      If No, explain: Click here to enter explanation.
      v. Sediment will be removed from sediment traps or sedimentation ponds when design capacity has been reduced by 50%: ☒Yes ☐No
      If No, explain: Click here to enter explanation.
      vi. Litter, construction debris, and construction chemicals exposed to stormwater shall be prevented from becoming a pollutant source for stormwater discharges: ☒Yes ☐No
      If No, explain: Click here to enter explanation.
      vii. Off-site material storage areas used solely by the permitted project are being covered by this SWPPP: ☐Yes ☒No
      If Yes, explain additional BMPs implemented at off-site material storage area: Click here to enter explanation of additional BMPs.
   b. Stabilization Practices

i. Description and Schedule:
Vegetation will be re-established by seed/straw once soil disturbance activities cease on the outparcel lot. Solid sod will be installed for all other areas.

ii. Are buffer areas required? ☒Yes ☐No

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

If No, explain why not: Click here to enter explanation.

If Yes, describe natural buffer areas: Existing vegetation along the project perimeter will be left in place as long as practical.

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

If No, explain: Click here to enter explanation.

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

c. Structural Practices

i. Describe any structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site: Silt Fences, Rip Rap, Inlet Traps, Straw Wattles

ii. Sediment Basins:

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

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

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

☐3600 cubic feet per acre= Enter capacity of basin.

or

☐10 year, 24 hour storm = Enter capacity of basin.

☐ Other criteria were used to design basin: Describe design criteria and basin capacity.

If No, explain why no sedimentation basin was included and describe required natural buffer areas and other controls implemented instead: BMP's will be installed and maintained in order to control sediment.

iii. Describe Velocity Dissipation Devices: Rip rap protection will be placed at all concentrated flow areas.

H. Other Controls

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

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

☒A stabilized construction entrance and exit

☐Vehicle tire washing

☐Other controls, describe: Click here to enter description.

c. Temporary Sanitary Facilities: Portable facilities owned and maintained by leasing company.

d. Concrete Waste Area Provided:

☒Yes

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

Explain why: Click here to enter explanation.

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

e. Fuel Storage Areas, Hazardous Waste Storage, and Truck Wash Areas: These will be located away from stormwater flow areas.

I. Non-Stormwater Discharges

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

☑Fire-fighting activities;

☑Fire hydrant flushings;

☑Water used to wash vehicles (where detergents or other chemicals are not used) or control dust in accordance with Part II.A.4.H.2;

☑Potable water sources including uncontaminated waterline flushings;

☑Landscape Irrigation;

☑Routine external building wash down which does not use detergents or other chemicals;

☑Pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled materials have been removed) and where detergents or other chemicals are not used;

☑Uncontaminated air conditioning, compressor condensate (See Part I.B.12.C of the permit);,

☑Uncontaminated springs, excavation dewatering and groundwater (See Part I.B.12.C of the permit);

☑Foundation or footing drains where flows are not contaminated with process materials such as solvents (See Part I.B.12.C of the permit);

b. Describe any controls associated with non-stormwater discharges present at the site: For ground dewatering, the pipe's outlet will be positioned to discharge over rip rap in order to prevent erosion and control velocities.

J. Post-Construction Stormwater Management:

Describe measures installed during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed: Stormwater discharges will flow over pervious surfaces to the maximum extend feasible before entering waters of the state.

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

L. Inspections

a. Inspection frequency:

☒Every 7 calendar days

or

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

b. Inspections:

Completed inspection forms will be kept with the SWPPP.

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

or

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

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

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

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

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

M. Maintenance:

The following procedures to maintain vegetation, erosion and sediment control measures and other protective measures in good, effective operating condition will be followed: The General Contractor will address action items noted on the inspection form.

Any necessary repairs will be completed, when practicable, before the next storm event, but not to exceed a period of 3 business days of discovery, or as otherwise directed by state or local officials.

N. Employee Training:

The following is a description of the training plan for personnel (including contractors and subcontractors) on this project: During our pre-construction meeting,

erosion control goals will be explained to the general contractor. The general contractor will train employees, subs, etc.

**Note, Formal training classes given by Universities or other third-party organizations are not required, but recommended for qualified trainers; the permittee is responsible for the content of the training being adequate for personnel to implement the requirements of the permit.

Certification

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

Signature of Responsible or Cognizant Official: _____

Title: Date: _____

## ARR150000 Inspection Form – Stormwater Pollution Prevention Plan Appendix B

Inspector Name: _____ Date of Inspection: _____

Inspector Title: _____

Date of Rainfall: _____ Duration of Rainfall: _____

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

Description of any Discharges During Inspection: _____

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

_____

Locations in Need of Additional BMPs: _____

Information on Location of Construction Activities

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

Information on BMPs in Need of Maintenance

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

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

_____ _____

_____ _____

SWPPP changes completed (date): _____

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

Signature of Responsible or Cognizant Official: _____ Date: _____

Title: _____

# SECTION 02010
# SOILS INVESTIGATION REPORT

## PART 1 - GENERAL

### 1.1 DESCRIPTION

A. General:
1. A soils investigation report has been prepared for the site of this work by Anderson Engineering Consultants, Inc., 3217 Neil Circle, Jonesboro, Arkansas 72401202, Phone: (870) 932-3700 / Fax: (870) 932-3769, hereinafter referred to as the Soil Engineer.

B. Availability:
1. The soils investigation report has been included in this Section of the Specifications.

C. Use of Data:
1. This report was obtained only for the Architect's use in design and is NOT PART OF THE CONTRACT DOCUMENTS. The report is available for bidder's information, but is not a warranty of subsurface conditions.
2. Bidders should visit the site and acquaint themselves with all existing conditions. Prior to bidding, bidders may make their own subsurface investigations to satisfy themselves as to site and subsurface conditions, but all such investigations shall be performed only under time schedules and arrangements approved in advance by the Architect.
3. Bidders shall acquaint themselves with the soils investigation pertaining to the types of soil conditions found at this site.

### 1.2 QUALITY ASSURANCE

A. Adjustment of Work:
1. Readjust all work performed that does not meet technical or design requirements, but make no deviations form the Contract Documents without specific and written approval from the Architect.

## PART 2 - PRODUCTS - NOT USED

## PART 3 - EXECUTION - NOT USED

**END OF SECTION**

# GEOTECHNICAL INVESTIGATION

# FOR

# PROPOSED ARKANSAS NORTHEASTERN COLLEGE

# NEW ALLIED TECHNOLOGIES CENTER

# BLYTHEVILLE, ARKANSAS

* * * * *

**ARKANSAS NORTHEASTERN COLLEGE**

**OWNERS**

**2501 SOUTH DIVISION STREET**

**BLYTHEVILLE, ARKANSAS 72315**

* * * * *

**FEBRUARY 17, 2016**

**JOB NO. 450015**

**ANDERSON ENGINEERING CONSULTANTS, INC.**

3217 Neil Circle – Jonesboro, Arkansas 72401
PHONE (870) 932-3700 • FAX (870) 932-3769

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE – JONESBORO, ARKANSAS 72401
PHONE (870) 932-3700 FAX (870) 932-3769

February 17, 2016

Job No. 450015

Mr. James R. Shemwell
Arkansas Northeastern College
2501 South Division Street
Blytheville, Arkansas 72315

Re: Geotechnical Investigation
Proposed Arkansas Northeastern College - New Allied Technologies Center
Blytheville, Arkansas

Dear Mr. Shemwell:

It is our pleasure to submit this report on the soil and foundation investigation for the proposed Arkansas Northeastern College - New Allied Technologies Center in Blytheville, Arkansas. The investigation consisted of field test borings, soils laboratory analyses, pavement analyses, and foundation design analyses.

We recommend that the earthwork and foundation excavations be verified by our geotechnical representative during the foundation construction phase of the project. This is the most feasible means of assuring the owners, designers, and builders that the geotechnical design intent is being achieved. In the event adverse geotechnical conditions are encountered during excavation, they can be identified and evaluated so that adequate remedial measures can be implemented during construction.

We wish to express our appreciation for the opportunity of serving you and other members of the design team. We are available for further assistance at any time during final design and construction, should you desire additional consultation.

Very truly yours,

ANDERSON ENGINEERING CONSULTANTS, INC.

Derek L. Blackwell, E.I.
Geotechnical Engineer

Scott W. Anderson, R.E.P., P.E.
Principal Engineer

DLB/SWA/plf
450015.GEO

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# GEOTECHNICAL INVESTIGATION

FOR

PROPOSED ARKANSAS NORTHEASTERN COLLEGE

NEW ALLIED TECHNOLOGIES CENTER

BLYTHEVILLE, ARKANSAS

* * * * *

ARKANSAS NORTHEASTERN COLLEGE

OWNERS

2501 SOUTH DIVISION STREET

BLYTHEVILLE, ARKANSAS 72315

* * * * *

BY

ANDERSON ENGINEERING CONSULTANTS, INC.

GEOTECHNICAL CONSULTANTS

3217 NEIL CIRCLE

JONESBORO, ARKANSAS 72401

FEBRUARY 17, 2016 JOB NO. 450015

# TABLE OF CONTENTS


| TEXT | PAGE |
|---|---|
| Important Information About Your Geotechnical Engineering Report | i |
| Purpose | 1 |
| Scope | 1 |
| Authority | 2 |
| Project Description | 2 |
| Regional Geology | 3 |
| Groundwater Conditions | 3 |
| Site Drainage | 4 |
| Seismicity | 4 |
| Liquefaction | 5 |
| Field Investigation | 6 |
| Laboratory Testing | 7 |
| Moisture Content | 7 |
| Atterberg Limits | 7 |
| Mechanical Grain Size Analyses | 7 |
| Shrinkage/Swell Tests | 8 |
| Earthwork | 8 |
| Site Preparation | 8 |
| Fill Placement | 9 |
| Excavation Criteria | 10 |
| Landscaping/Hardscaping | 10 |
| Adverse Weather Conditions | 11 |
| Shallow Foundations | 11 |
| Bearing Capacity | 12 |
| Settlement | 12 |
| Other Design Considerations | 13 |
| Excavation/Monitoring | 13 |
| Floor Slab | 14 |
| Soil Recommendations | 14 |
| Granular Fill | 14 |
| Vapor Membrane | 15 |
| Lateral Earth Pressures | 15 |
| Drives and Parking Areas | 16 |
| Flexible Pavement | 17 |
| Rigid Pavement | 17 |
| Pavement Performance/Maintenance | 18 |
| Construction Quality Control | 19 |
| Conclusions and Recommendations | 19 |
| Limitations | 20 |

| APPENDIX A | PLATE |
|---|---|
| Vicinity Map | 1 |
| Plan of Borings | 2 |
| Logs of Borings | 3 - 11 |
| Field Classification System for Soil Exploration | 12 |
| Field Identification System for Rocks | 13 |
| Key to Soil Classifications and Symbols | 14 |
| Consolidated Geologic Formations Graphic Log Symbols | 15 |
| Unified Soil Classification System (ASTM D 2487) | 16 |
| Design Calculations and Bearing Capacity Curves | 17 - 20 |
| Conventional Footing - Explanation of Bearing Capacity Calculations | 21 |
| Straight Shaft Drilled Piers - Explanation of Bearing Capacity Calculations | 22 |
| Horizontal Deflection at Pier Top | 23 |
| Typical Earth Pressure Values | 24 |
| Recommended Flexible and Rigid Pavement Sections | 25 |

| APPENDIX B | PLATE |
|---|---|
| Moisture Content Determination (ASTM D 2216) | B1 |
| Atterberg Limit Determination (ASTM D 4318) | B2 - B3 |
| Mechanical Grain Size Analyses (ASTM D 422) | B4 - B10 |
| Shrinkage/Swell Index Test (FHA Publication No. 701) | B11 - B13 |

# Important Information About Your Geotechnical Engineering Report

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

*The following information is provided to help you manage your risks.*

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

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

## Read the Full Report

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

## A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

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

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

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

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

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

## Subsurface Conditions Can Change

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

## Most Geotechnical Findings Are Professional Opinions

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

## A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

## A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

## Do Not Redraw the Engineer's Logs

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

## Give Contractors a Complete Report and Guidance

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

## Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

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

## Obtain Professional Assistance To Deal with Mold

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

## Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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

*Copyright 2004 by ASFE, Inc. Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with ASFE's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of ASFE, and only for purposes of scholarly research or book review. Only members of ASFE may use this document as a complement to or as an element of a geotechnical engineering report. Any other firm, individual, or other entity that so uses this document without being an ASFE member could be committing negligent or intentional (fraudulent) misrepresentation.*

IIGER06045.0M

## PURPOSE

The primary purposes of this geotechnical investigation were:

a. To determine the physical and engineering properties of the soils within the area of the proposed construction with respect to their suitability for the support of the proposed facility.

b. To make recommendations for the earthwork, pavements, and the types of foundations most suited for the prevailing soil conditions within the proposed construction area.

c. To evaluate and recommend the design procedures for the various soil, pavement, and foundation items in accordance with current engineering practices.

## SCOPE

The scope of the this geotechnical investigation includes the following:

a. The geological features in the vicinity of the project consist primarily of residual clays overlying sand. The site is located in Blytheville, Arkansas, as shown on the Vicinity Map, Plate 1. Soils in the area typically consist of alluvial and terrace deposits of sands, silts, and clays from the rising and falling of the Mississippi River and tributaries.

b. It was concluded by the geotechnical engineer that twenty-five borings would be required to obtain the necessary data for design of the proposed facility. The borings were placed strategically within the various buildings and parking/drive areas, as shown on the Plan of Borings, Plate 2.

c. Field tests consisted of Standard Penetration test samples (ASTM D 1586) taken in all the borings. Logs of the borings illustrating stratigraphic and field test information are provided on Plates 3 through 28. The field classification systems for soil and rock exploration and keys to soil and rock classification and symbols are provide on Plates 29 through 30.

d. The soils analyses were based on N-values obtained from the drilling program, visual observations, and other routine inspection/classification methods. The soils were classified basically in accordance with the Unified Soil Classification System (ASTM D 2487) shown on Plate 31; however, visual classifications my be given in some instances on the logs.

e. A laboratory testing program was developed by the geotechnical engineer after visual observation of the samples obtained and review of the field boring logs. Laboratory tests included moisture content determination, Atterberg limits, mechanical grain size analyses, and shrinkage/swell Tests. The individual test results are provided in Appendix B.

f. The foundation analyses were based on based on AECI's current foundation design procedures using the N-values obtained during drilling, results of the laboratory tests, and the results of our in-house capacity calculations. The results of the calculations for conventional shallow foundation are provided with a plot illustrating bearing capacity with depth provided on Plates 32 and 33. An explanation of the calculations is provided on Plate 34.

g. The flexible and rigid pavement sections discussed in this report are based on the design method utilizing estimated California Bearing Ratio (CBR) data derived from field/laboratory investigations and generally accepted industry standards. The proposed flexible and rigid pavement sections are provided on Plate 35.

## AUTHORITY

This geotechnical investigation was authorized on November 24, 2015, by signed acceptance of AECI Proposal No. 81015 dated November 18, 2015, by Mr. James R. Stemwell of Arkansas Northeastern College, the owners of the proposed project.

## PROJECT DESCRIPTION

The project will consist of the construction of a new school with aviation training facility on an undeveloped tract of land. The proposed site is located approximately 700 feet north of Dogwood Road, on the west side of Division Street in Blytheville, Arkansas, as shown on the Vicinity Map, Plate 1. The proposed construction area is covered with grass, is generally flat, and was holding surface water at the time of this investigation. The structure will be a one-story, steel frame building with an

aviation facility and pavements. Conversations with the civil engineer indicates the site will be elevated approximately 3.0 feet above existing grade. An ATV-mounted drill rig was necessary to access the boring locations with some difficulty due to soft soil conditions and repetitive rain events.

## REGIONAL GEOLOGY

The site is located in the Mississippi Embayment Physiographic Province of eastern Arkansas. The geology of the area typically consists of sediments deposited by the ancient Mississippi River and its tributaries during Quaternary times. The soils result from the deposits of small streams, the overbank deposits of major streams, and the older meander belt of major streams and generally consist of mixtures of silt and clay with some amounts of sand. The site stratigraphy was found to be consistent with the local geology.

## GROUNDWATER CONDITIONS

Groundwater was encountered during this investigation at depths as shallow as 4.0 feet; however, this should not effect most excavations. The water level, though, is considered seasonal in nature and will rise and fall with fluctuations in rainfall. Thus, groundwater could be expected during construction and should be considered in design and construction of utilities and equipment pits. Temporary dewatering of these types of excavations by sump/pump may be required.

After recent heavy rains, perched water was encountered across the site and will likely be encountered near the surface during wet/winter construction sequences. This latent water condition is typically due to storage of recent rainfall or by a barrier to capillary evaporation. Perched water when encountered will most likely be brief in duration and typically in low quantities. Areas likely to contain perched water include very flat areas, old drainage swales, right-of-ways, and existing utility trenches.

Where perched water is encountered the contractor should expect to excavate gravity drainage ditches to divert it away from the construction area. Additionally, soft, wet and pumpable soils can be expected. In structural areas, these soils may require removal and replacement with a select fill soil compacted in accordance with criteria provided in the **EARTHWORK** section of this report. Since the quantity of undercut will be an unknown, it would be prudent to establish a unit rate for this item of work during the bidding process to minimize construction delays.

## SITE DRAINAGE

The designer should also consider the topography of the site and surrounding areas during planning, design, and construction. The final grading should ensure positive drainage away from the building. It is strongly recommended that roof drains, condensate lines, and other potential water sources divert water away from the building, preferably to the storm sewer system, to prevent accumulation around the perimeter of the proposed structure. The subgrade soils have the ability of absorbing significant amounts of moisture, which could be detrimental as strength loss under foundation elements and pavements.

Consideration should be given to control of surface water runoff during construction as the site is very flat. The contractor should consider excavating a gravity drainage ditch around the perimeter of the construction areas in an effort to provide some runoff. The proposed construction area should be maintained in a well drained condition to prevent water from ponding within the structural and parking areas. Saturation of the subgrade soils could require additional amounts of undercut, especially during wet/winter months.

## SEISMICITY

The seismic analysis requires the selection of appropriate site coefficients and other seismic values that can be established from the subsurface conditions, guidelines set forth by local, state, and federal codes, and historical seismic information. The structure should be designed using guidelines as set forth in

the 2012 International Building Code as required by **Arkansas Act 1100-1991** (and subsequent amendments) as determined appropriate. The site soils consist primarily of silty clay (CL). Based on experience at other sites in the area, the basal material beyond the depths investigated is dense sand and/or sandy gravel. The following seismic values were obtained from the U.S. Geological Seismic Design Maps application and are considered applicable to this project site based upon the site conditions and the 2012 International Building Code (IBC) seismic values for Arkansas:

IBC (2012)

| | |
|---|---|
| Site Class | D |
| Value of Site Coefficient ($F_a$) | 1.000 |
| Value of Site Coefficient ($F_v$) | 1.500 |
| Spectral Response Acceleration at Short Periods ($S_s$) | 2.718 g |
| Spectral Response Acceleration at a Period of 1.0 Second ($S_1$) | 1.062 g |

## LIQUEFACTION

Liquefaction is the sudden loss of all shear strength in a soil as a result of excess pore water pressure which is induced by vibration from an earthquake. Although liquefaction is primarily associated with saturated cohesionless soils below the groundwater table, weak cohesive soils are also susceptible to this phenomenon. When soils experience liquefaction they lose strength, the ability to resist load, and generally behave as a liquid. The increase in pore pressure may also cause upward flow of water to the ground surface resulting in the formation of mud spouts or sand boils. The soils at this site primarily consist of soft to stiff clays overlaying very dense sand.

The location for the proposed facility is within the New Madrid Seismic Zone. A peak horizontal acceleration coefficient of at least 2.04g can be estimated for the area. A magnitude 7.0 earthquake is considered likely in the future based on the USGS Publication FS-131-02 which suggests that major earthquakes (magnitude 7.0 or greater) reoccur in the region approximately every 500 years, with the last sequence being in 1811-1812. A five hundred-year interval between magnitude 7.0 or greater earthquakes is much more frequent than expected, given the recent level of earthquake activity in the New Madrid region.

It should be noted that the overburden clays can be designated as non-liquefiable due to their moisture content and plasticity. Investigators and several publications state, "saturated sands deeper than 50 feet and/or if their effective overburden stress exceeds 4000 psf, the soil is not liquefiable". Past analyses done by AECI for other projects, indicate a potential settlement of nearly 10.0 to 12.0 inches could occur due to liquefaction considering the local geology. Utilizing deep foundations could significantly reduce this value; however, are not considered cost effective for the type of structure. It should be noted that experts expect almost complete failure of infrastructure in the New Madrid zone in the event of a 7.0 magnitude event.

## FIELD INVESTIGATION

On December 21 through 23, 2015, and January 7 through 12, 2016, geotechnical drilling crews performed the drilling and sampling of twenty-five borings within the building, drive, and parking areas. The borings were placed strategically in an effort to obtain data from across the construction areas, as shown on the Plan of Borings, Plate 2. Standard Penetration Tests (SPT) were performed at selected intervals to determine the consistency of the subgrade soils. This testing consists of driving a split spoon sampler a total of 18.0 inches and recording the number of blows for each 6.0-inch increment. The number of blows required for the last two increments are summed to arrive at an SPT ("N") value. A value greater than 50 blows per foot is considered refusal. The soil samples obtained from this testing were visually classified in the field by an engineering technician or geologist. The logs of the borings showing the stratigraphy at each location and N-values with depth are provided on Plates 3 through 28. The Field Classification System for Soil and Key to Soil Classifications and Symbols are provided on Plates 29 and 30, with the Unified Soil Classification System presented on Plate 31.

## LABORATORY TESTING

Tests were performed on select samples to determine their classification and/or strength characteristics. Laboratory testing included moisture contents, Atterberg limits, mechanical grain size analyses, and shrinkage/swell index tests. The following sections describe the results of these tests. Individual test results are shown in Appendix B.

### Moisture Content:

The moisture content of selected samples was determined in an effort to aid in the earthwork recommendations. The moisture content of the near surface samples tested (<5.0 feet) ranged from 23.05% to 32.79%. The excessive range of moisture content is likely due to the rains experienced on site at the time of drilling. However, the materials moisture values appear to have no effect on their respective N-values. Site access and mobility will likely be difficult and could require undercut or stabilization to facilitate construction. Additionally, difficulty with backfilling excavations should be expected due to these elevated moisture values.

### Atterberg Limits:

Atterberg limit tests were performed on selected samples to aid in classification and to determine the potential volume change of the soils. Based on the tests performed, the materials encountered during this investigation were found to be a slightly plastic clay. The liquid limit (LL) of the soils ranged from 27 to 53, with the plasticity index (PI) within the range of 7 to 31. These values indicate some isolated soils present may be slightly susceptible with respect to shrinkage/swell.

### Mechanical Grain Size Analyses:

Mechanical grain size analyses were performed on representative samples to aid in classification. The samples tested contained a minimum of 95.0% fines (passing the No. 200 sieve). Based on these tests and the Atterberg limit tests performed, the site soils would classify predominately as silty clay (CL).

**Shrinkage/Swell Tests**:

Visual inspection and laboratory plasticity tests performed on selected samples indicated that a portion of the clays present may be moderately susceptible with respect to shrinkage and swell potential, and thus;, cause some detrimental effects on the proposed structures. Three representative samples with varying PI's were tested. The results of these testes indicated a maximum swell pressure of 416 psf and a linear shrinkage of 13.0%. Provided all criteria in the **EARTHWORK** section is met or exceeded, the potential for vertical rise should be maintained at tolerable limits (<0.25 inch).

## EARTHWORK

The following sections are intended to provide the designer and contractor with guidelines for construction of the project. They are not intended to be used as a specification for construction procedures or methods. It is strongly recommended that any desired modification be reviewed by the soils engineer prior to implementation into the project specifications. Site conditions different from those indicated herein may result in alteration of these recommendations, but should be verified by the soils engineer, or his representative.

**Site Preparation**:

A stripping depth of 12.0 to 18.0 inches should be utilized in bidding to account for organic laden soils from previous agricultural use. Deeper stripping depths may be required in lower lying areas, drainage swales, and heavily vegetated areas. Upon completion of stripping, any required cuts should be performed, allowing the exposed subgrade to be proof rolled. Proof rolling should consist of a loaded, tandem axle dump truck performing numerous passes across the proposed construction areas. Any soft or unstable soils encountered should be undercut or scarified, moisture conditioned, and recompacted. Ninety-five percent of ASTM D 698 should provide suitable subgrade compaction prior to fill placement.

Data obtained from the borings indicate a majority of the soils present at the surface (0.0 to 1.5 feet) were soft. An increase in strength was encountered in the underlying soils. Dependent on local weather conditions difficulty with site access and mobility should be expected, as significant amounts of undercut or stabilization could be required. Furthermore, winter perched groundwater present in these materials could further inhibit excavations. The contractor should expect some difficulty in backfilling excavations or placing new fill, as the elevated moisture content of the soils would make placement and compaction of conventional fill problematic. These conditions should be greatly improved during warmer and drier months of the year and should be considered by the design and construction team.

**Fill Placement**:

Fill materials for the project should consist of granular, non-expansive type soils with a plasticity index (PI) between 5 and 20 per ACI 360R. A minimum approximate dry density of 115.0 pcf is typical for soils meeting this criteria. Other locally available soils including clay gravel may also be suitable, but must be approved by the soils engineer prior to their use. On-site soils with a PI of less than 20 may be used, provided they are moisture conditioned. Fill soils should be placed in maximum 8.0-inch loose lifts, moisture conditioned to within two percentage points of optimum moisture content, and compacted to a minimum of 98% Standard compaction per ASTM D 698. At no time should the particle size of the material exceed the lift thickness. It should be noted that wet weather conditions may result in higher moisture contents in otherwise suitable fill soils. Aeration and drying of off-site fill soils may also be required.

The compaction and moisture content of fill materials should be verified through field density tests. One test per lift should be performed for every 2500 square feet of building area, but could be increased to 5000 to 10,000 square feet for parking. It would be prudent to require the performance of Atterberg limits and mechnical grain size analyses of fill materials during placement to ensure compliance with the criteria outlined herein as borrow pit soils may vary significantly across the pit.

**Excavation Criteria**:

The overburden soils encountered should be excavated with normal tracked excavators. Shallow trench excavations for utilities should be completed with normal excavation equipment. A majority of the site soils are cohesive and should not be prone to significant sloughing or cave-ins, except when saturated from heavy rain periods. However, given their current condition and shallow water, some cave-ins are probable. Based on OSHA regulations (29 CFR 1926, Part P) regarding soil classification for trench excavations, the soils encountered would best classify as Type C. In any case, OSHA regulations regarding shoring or benching of excavations should be considered during construction. Backfilling trench excavations should satisfy the criteria given previously, though AHTD approved flowable fill may be used as an alternative for confined spaces provided it is allowed to properly cure.

**Landscaping/Hardscaping**:

The preferred landscaping method is to utilize green areas having a root barrier and a drainage system tied into the storm sewer system. Drip irrigation is preferred so that the amount of water can be controlled and routed away from the building ensuring that saturation of the foundation soils will not occur. As a general rule, the drip line of any existing or future full grown tree should not fall within the building area. Moisture control will also be added by having sidewalks, paving, properly drained green areas, or sloping ground surfaces for at least 5.0 feet outside the structure.

The sidewalks or paving must have positive slope away from the building and all joints must be sealed to prevent water infiltration. Implementation of these points will reduce the fluctuations in moisture content of the highly plastic soils and consequent movements of the foundations and floor slabs. It would also be prudent to capture roof drain outlets and AC unit condensate drip lines in the project storm sewer system. By doing so, the likelihood of distress from moisture variations to buildings, landscapes, and pavements is greatly decreased.

**Adverse Weather Conditions**:

Site grading and earthwork operations will be more difficult in wet or winter months. Should earthwork operations for the project begin in the time period of November through April, the owner should anticipate and budget for additional expenses for earthwork. Not only will more frequent and saturating rains be prevalent during these months, ambient air conditions are not conducive to drying of site soils. Efficient aeration and drying of soils (including potential fill soils) is dependant upon high temperatures, low humidity, and the contractor's ability to disc or scarify the soils. Aeration and drying of soils will require additional effort by the contractor and should be considered during budgeting or planning.

Should the owner or contractor elect to begin earthwork in wet or winter months, undercut of soft soils will likely be the most feasible option. Mechanical stabilization of the on site soils is also possible and could include the use of a geotextile fabric/grid to bridge over soft soils and provide support to subsequent fill. Implementation of a geotextile can be addressed once the grading plan for the project is near completion. Chemical stabilization through lime or fly ash worked into wet soils can also be effective. However, these methods are highly dependant upon the contractor's expertise, equipment, and proper installation or mixing methods. In any case, the proposed construction area should be maintained in a well drained condition during construction. Water should not be allowed to stand or pond on areas of exposed earthwork. In anticipation of rainfall, it would be prudent for the contractor to "seal" exposed subgrades with a smooth drum roller to promote runoff. Additionally, surface drainage control features such as stormwater ponds should be installed as soon as it is practical.

## SHALLOW FOUNDATIONS

Conventional shallow foundations (strip/spread) are considered a feasible foundation option for the proposed structures and appurtenances. The following discussion will provide bearing capacity, settlement, and other criteria typically required for in design. For the purposes of this report, bearing capacity refers to the net allowable bearing capacity, which is defined by the ultimate bearing capacity

(factored dead and live loads) reduced by an acceptable factor of safety, which for this project is considered to be 2.0. Additionally, shape, inclination, groundwater depth, and other design factors are accounted for in this analysis and no additional reduction in bearing capacity are necessary for these conditions.

**Bearing Capacity**:

Based on the results of our field investigation a bearing capacity of 1500 psf should be applicable for foundations bearing on 2.0 feet of properly compacted select fill for the main building and aviation facility. A maximum foundation depth of 2.0 feet below finished grade is required. The calculations and curve illustrating bearing capacity with depth are provided on Plates 32 and 33, respectively. Should the designer desire to vary the bearing depths or capacities, this firm should be consulted for additional recommendations. An explanation of the bearing capacity calculations is provided on Plate 34. It should be noted that the provided bearing capacity is applicable only if all criteria in the **EARTHWORK** section is met or exceeded. Interior footing depths may be decreased, so long as they satisfy local building codes, but should still bear on the fill material.

**Settlement**:

The settlement of the foundations must be within tolerable limits, which are typically determined by the structural engineer, but have not been provided. The potential settlement for conventional footings was estimated from results of the field and laboratory investigations and recommendations provided previously. The magnitude of total settlement for each building for conventional footings at the recommended bearing capacity and depth was estimated to be on the order of 1.00 inch. A differential settlement on the order of 0.50 inch is recommended for use in the structural design for all buildings. Due to the variability of the bearing strata, including mass fill, the structural engineer would be prudent to increase the rigidity of the foundation in an effort to minimize potential differential movements associated with variable settlement. Should the bearing capacity differ from those indicated herein, the amount of settlement will vary accordingly.

**Other Design Considerations:**

The bearing capacity and settlement discussions provided previously assume that the structural loadings are positioned such that a relatively uniform bearing pressure is exerted to the bearing strata. Eccentric, inclined or other loadings that result in a non-uniform bearing pressure will require further evaluation by this firm once specific loading conditions are established. In any case, it would be prudent to increase the rigidity of the foundation in an effort to minimize potential differential movements. An increase in rigidity can be achieved by techniques that would increase the section modulus of the foundation members. Column and wall footing should be designed in accordance with the requirements of the various applicable codes.

Resisting uplift loads should consider the weight of the footing and overlying soil backfill. A minimum factor of safety of 1.5 is recommended when calculating uplift resistance. For resistance of lateral forces, a net allowable passive resistance of 300 psf can be used for the portion of the footing extending beyond depths of 1.5 feet. A coefficient of sliding resistance of 0.35 may be used by the designer to calculate frictional resistance along the bottom surface of the footing for typical select fill.

**Excavation/Monitoring:**

The excavations for foundations should be performed with equipment capable of providing a clean bearing surface. It would be ideal for the bottom 6.0 inches of the excavation be achieved with a smooth plate excavator, or hand labor. Reinforcing steel and concrete should be placed as soon as possible upon completion of the geotechnical representative evaluation, as described below. All debris, standing water and mud, including saturated soils, should be removed. In no instance should concrete be placed in frozen or saturated soils. If unforeseen circumstances require excavations to remain open for an extended period, a thin "mud slab" may be placed in an effort to reduce disturbance to the bearing strata. In this case, the excavation should extend a minimum of 2.0 inches below planned depth, allowing a thin layer of concrete the same strength as required for the foundations to be placed.

The performance of the foundation system will partially depend on the quality of construction. It would be prudent to have further evaluations by the soils engineer, or his representative, to verify that the design bearing value has been achieved in foundation excavations. Furthermore, the condition of the subgrade should be evaluated to insure cleanliness and uniformity of bearing strata immediately prior to concrete placement. Bearing capacity can be verified by the use of a static cone penetrometer, or other acceptable means designated by the soils engineer.

## FLOOR SLABS

Differential movement of the floor slab may be caused by a difference in the allowable gross bearing capacity, differing heave conditions, and/or variable thicknesses of compressible soils below the floors. The stiffness effect of a well compacted subgrade and/or engineered fill as given in the **EARTHWORK** section should greatly diminish the differential floor slab movements to tolerable limits.

### Soil Recommendations:

Based on the anticipated grades it appears that floor slabs for the building will bear on compacted select fill. For this condition the designer should consider a modulus of subgrade reaction (k) of 125.0 pci over the top 8.0 inches of subgrade. The designer should specify that if there is significant lag time between fill placement and slab placement that the contractor restore the top 8.0 inches of subgrade to its originally placed moisture and density prior to slab placement. This will aid in prevention of post construction slab movements induced by moisture variations inherent to any soil type, especially for exposed or polished floors with no covering.

### Granular Fill:

In the American Concrete Institute (ACI) Publication 302.1R-04, Subsection 4.1.4, a "base material" is recommended in place of the conventional cleaner "sand cushion" material. The manual maintains that clean sand (commonly "cushion" sand) is difficult to compact and maintain until concrete

placement is complete. ACI recommends a clean, fine graded material (with at least 10% to 30% of particles passing a #100 sieve) which is not contaminated with clay, silt or organic material. The sand material should be placed in a moist condition so as not to impact subgrade soil moisture. Additionally, the sand material should be consolidated by a vibratory plate or similar equipment. Slag does not meet this criteria and should not be used in any area below the floor slab for any proposed buildings.

**Vapor Membrane**:

The need for a vapor membrane depends on whether the floor slab will have a vapor sensitive covering, will have vapor sensitive items stored on the slab, or if the space above the slab will be a humidity controlled area. If the project does not have this vapor sensitivity or moisture control need, placement of a vapor membrane may not be necessary. However, if any of the above sensitivity issues apply, placement of a minimum 10-mil vapor membrane is recommended. Some floor covering systems (adhesives and flooring materials) may require a vapor membrane to maintain a specified maximum slab moisture content as a condition of their warranty.

## LATERAL EARTH PRESSURES

The lateral pressure for use in designing retaining or service pit walls, which are to be backfilled with select compacted fill, should be a function of the wall type, i.e., cantilever, counterfort, basement, etc. Consideration must be given to specifying the use of clean sand (ASTM C 33) or other free draining backfill material in an effort to minimize backfill settlement and pressure problems. Drainage holes and a backfill drainage media should be required adjacent to the wall to relieve any static pressures. The following design values are contingent upon the fact that positive drainage will be assured behind the wall and drainage of the backfill material will be an integral part of the overall site drainage system. Based on the free draining select backfill material described above or select compacted fill soils, the estimated earth pressure values given in following Table I can be used if all backfill is compacted to at least 98% Standard Proctor density:

TABLE I
LATERAL EARTH PRESSURE DATA

| Property | Free Draining Material | On-Site Clay Soils |
|---|---|---|
| Cohesion © | 0 psf | 1000 psf |
| Internal Angle of Friction | 30° | 17° |
| Moist Density | 135.0 pcf | 125.0 pcf |
| Ko | 0.50 | 0.71 |
| Ka | 0.33 | 0.55 |
| Kp | 3.00 | 1.83 |
| Friction | 0.57 | 0.31 |

The designer should check any wall design for bearing, sliding, and overturning to ensure proper wall performance. A net allowable passive resistance may be estimated by multiplying the soil weight by the previously given Kp. The coefficient of sliding resistance, used by the designer to calculate frictional resistance along the bottom surface of the footing, is typically considered to be the 'Friction' value given above.

## DRIVES AND PARKING AREAS

The following pavement designs and pavement recommendations are based on numerous reasonable assumptions concerning the pavement use, site conditions, and maintenance. An estimated CBR of 3 was determined for the subgrade soils based on SPT values obtained from borings in the parking area of the site and the criteria provided in the **EARTHWORK** section. The base material and surface material thicknesses and construction procedures are provided in the following sections. Soft soil conditions were encountered in the proposed parking areas. Varying amounts of undercut may be required to provide adequate support for the pavement section, but could somewhat be controlled by beginning these operations in summer months. A minimum of 1.5 to 2.5 feet of select fill is also anticipated for development of finished grades for the project.

**Flexible Pavement**:

Flexible pavement typically consists of asphalt cement hot mix (ACHM) as specified by Section 407 of the Standard Specifications for Highway Construction (Edition of 2014) as published by the Arkansas State Highway and Transportation Department. The design requirements for ACHM surface course; 12.5 mm (Type II) and 9.5 mm (Type III) are provided in Tables 407-1 and 407-2, respectively. ACHM is most commonly used for light to moderate traffic areas including straight drives and parking areas for light vehicles. It should not be used in traffic lanes where trucks turn, backup, or pickup trash dumpsters. Based on the subgrade CBR of 3 and a minimum of 18.0 inches of compacted fill the sections on the following page will apply for light and heavy duty sections. The recommended pavement structures are shown on Plate 35.

| LIGHT | | HEAVY | |
|---|---|---|---|
| Material | Thickness (inches) | Material | Thickness (inches) |
| 12.5 mm ACHM | 2.0 | 12.5 mm ACHM | 3.0 |
| Class 7 Base | 6.0 | Class 7 Base | 8.0 |

**NOTES:**

1) Class 7 - 90% crushed stone meeting AHTD Table 303-1.
2) Compaction of ACHM should not be less than 92% of theoretical design mix.
3) Base material compaction should not be less than 95% ASTM D 1557.
4) Slag may be used in pavement areas in place of crushed stone, provided it meets the requirements of AHTD Table 303.1, is non-expansive, and is increased in thickness by 2.0 inches to account for a lower CBR value.

**Rigid Pavement Non-Reinforced**:

Rigid pavements or Portland Cement Concrete (PCC) pavements consists of concrete materials and construction procedures as specified by Section 501 of the Standard Specifications for Highway Construction (Edition of 2014) as published by the Arkansas State Highway and Transportation Department. The material type and design requirements including admixtures, reinforcing, dowels, jointing, curing, and finish are provided therein. Rigid (PCC) pavements are commonly used for both light and heavy duty traffic applications. Minimally, approach slabs, truck turning areas, docks, and dumpster pads should be PCC. Based on the site subgrade CBR of 3 and a modulus of subgrade

reaction of 125.0 pci over the minimum of 18.0 inches of compacted fill, the following sections will apply for both light and heavy duty pavement sections. The recommended pavement structures are shown on Plate 35.

| LIGHT | | HEAVY | |
|---|---|---|---|
| Material | Thickness (inches) | Material | Thickness (inches) |
| PCC | 5.0 | PCC | 7.0 |
| Class 7 Base | 4.0 | Class 7 Base | 6.0 |

**NOTES:**

1) Class 7 - 90% crushed stone meeting AHTD Table 303-1.
2) PCC strength to be 4000 pci at 28 days.
3) PCC to be entrained with 5% air.
4) Load transfer, dowels, and joints per ACI, AHTD or PCA guidelines.
5) Slag may be used in pavement areas in place of crushed stone, provided it meets the requirements of AHTD Table 303.1, is non-expansive, and is increased in thickness by 2.0 inches to account for a lower CBR value.

**Pavement Performance/Maintenance**

The long term pavement performance will be directly related to several factors such as adequate edge drainage and surface drainage which does not allow water to accumulate on the pavement surface or behind the curbs and pavement edges. All pavement joints must be sealed and should be placed parallel to the overall site drainage direction. All irrigation, water, and other utility lines should be carefully monitored to insure they do not contribute to premature pavement failure by allowing water to migrate onto or under the pavements. Adequate quality control testing including proof rolling, compaction testing, thickness testing of base and ACHM as well as compaction of the ACHM is critical to successful long term pavement performance. In addition, pavements will require regular maintenance such as periodic surface sealing and crack sealing to prolong the desired performance and life.

## CONSTRUCTION QUALITY CONTROL

Quality control testing should be utilized in all phases of the construction. To verify that the proper performance of the proposed structures, all fill required should be compacted to a minimum of 98% Standard compaction, in accordance with ASTM D 698. The foundation excavations should be evaluated to verify that the recommended bearing capacity has not been reduced by disturbance to excavation or massive imperfections in the bearing strata. A geotechnical engineering representative should be present to evaluate the bottom of the foundation excavations by means of a static cone penetration device. The compaction of the pavement sections should be verified by tests after the earthwork is completed, so as not to invalidate the design criteria. Our recommendations are based upon adequate quality control testing being utilized and further evaluations and reviews during the construction phase of the project.

## CONCLUSIONS AND RECOMMENDATIONS

As a result of this geotechnical investigation, the following recommendations are offered for consideration:

1. As previously discussed, conventional footings would serve satisfactorily for the proposed structures. It is concluded that this will be an economical type of foundation and should be designed in accordance with necessary structural and/or architectural requirement determined by the designers with the owner's ultimate approval.
2. Since up to 18.0 inches of stripping and up to 3.0 feet of fill will be required to achieve estimated final grades, conventional footings bearing on a minimum of 2.0 feet of fill can be designed at an allowable bearing capacity of 1500 psf.
3. All fill required should consist of low PI non-expansive fill and should be placed in 8.0-inch thick lifts and be compacted within two percentage points of optimum moisture content to 98% of Standard Proctor density as per ASTM D 698. The select fill shall have a PI between 5 and 20 per ACI 360R. Locally available shales may also be utilized for this project, but must meet the criteria given in the **EARTHWORK** section of this report.

4. Undercutting or stabilizing of soft, wet, or unstable soils will be required in building and pavement areas. The contractor may replace the undercut areas with suitable backfill (PI = 5 to 20) if it is compacted to 98% of Standard Proctor.
5. As an additional measure, perimeter surface and subsurface drainage should be assured around the exterior of the buildings to intercept and drain surface runoff or seepage water from the near surface and foundation supporting soils. It would also be a prudent measure to slope backfill soils away from foundation walls and install all site drainage features as soon as it is practical.
6. The use of flexible or rigid pavements should be a function of the anticipated traffic use as determined by the designer using the recommended sections provided on pages 13 through 15 of this report. As a minimum PCC pavements should be used for truck/bus lanes and dumpster pads.
7. Quality control testing should be utilized in the construction of the foundation, undercutting, fill placement, and floor slab construction with adequate testing to verify that the design requirements have been achieved.
8. Geotechnical engineering and testing services are recommended during the foundation construction phase so that adequate compensation can be made for conditions that may occur which differ significantly from those assumed as a result of this investigation.
9. Other recommendations are given throughout the text of this report.

## LIMITATIONS

The boring logs shown in this report contain information related to the types of soil or rock encountered at specific locations and times and show lines delineating the interface between these materials, as well as results of tests performed in the laboratory on representative samples. The logs also contain our field geologist's interpretation of conditions that are believed to exist in those depth intervals between the actual samples taken. Therefore, these boring logs contain both factual and interpretative information. It is not warranted that these logs are representative of subsurface conditions at other locations and times.

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they existed at the time of our field investigation and further on the assumption that the exploratory borings are representative of the subsurface conditions throughout the site. If, during construction, different subsurface conditions from those encountered in our borings are observed, or appear to be present beneath excavations, we must be advised promptly so that we can review these conditions and provide new recommendations as becomes necessary. Recognize that both natural and manmade events may have changed site conditions since issuance of this report and further review may result. If after submission of this report structural loads or finished grades are changed from those that were assumed, we urge that we be promptly informed, and retained to review our report to determine the applicability of the conclusions and recommendations, considering the changed conditions and/or time lapse. Further, we request that our firm be retained to review those portions of the plans and specifications for this particular project that pertain to earthwork and foundations as a means to determine whether the plans and specifications are consistent with the recommendations contained in the report. The conclusions and recommendations contained herein are based on several assumptions regarding grades, anticipated loads, and location of the structure. It is understood that specific information was unavailable at this early stage of planning. It is strongly recommended that this firm be provided a copy of the plans for review upon completion. An in-depth review is considered necessary to verify the recommendations included in the text and their suitability in the final design.

It should be understood that there is the possibility that even with the proper application of current engineering principles, conditions may exist on the site that could not be identified within the scope of this investigation or which were not reasonably identifiable from the available information. The conclusions and recommendations in this report contain all the limitations inherent to the principles and practice of geotechnical engineering. AECI has not performed any observations, investigation, study, or testing that is not specifically listed in the scope of services. Thus, AECI shall not be liable for failing to discover any condition whose discovery required the performance of services outside of the scope of services provided in our proposal.

* * * * *

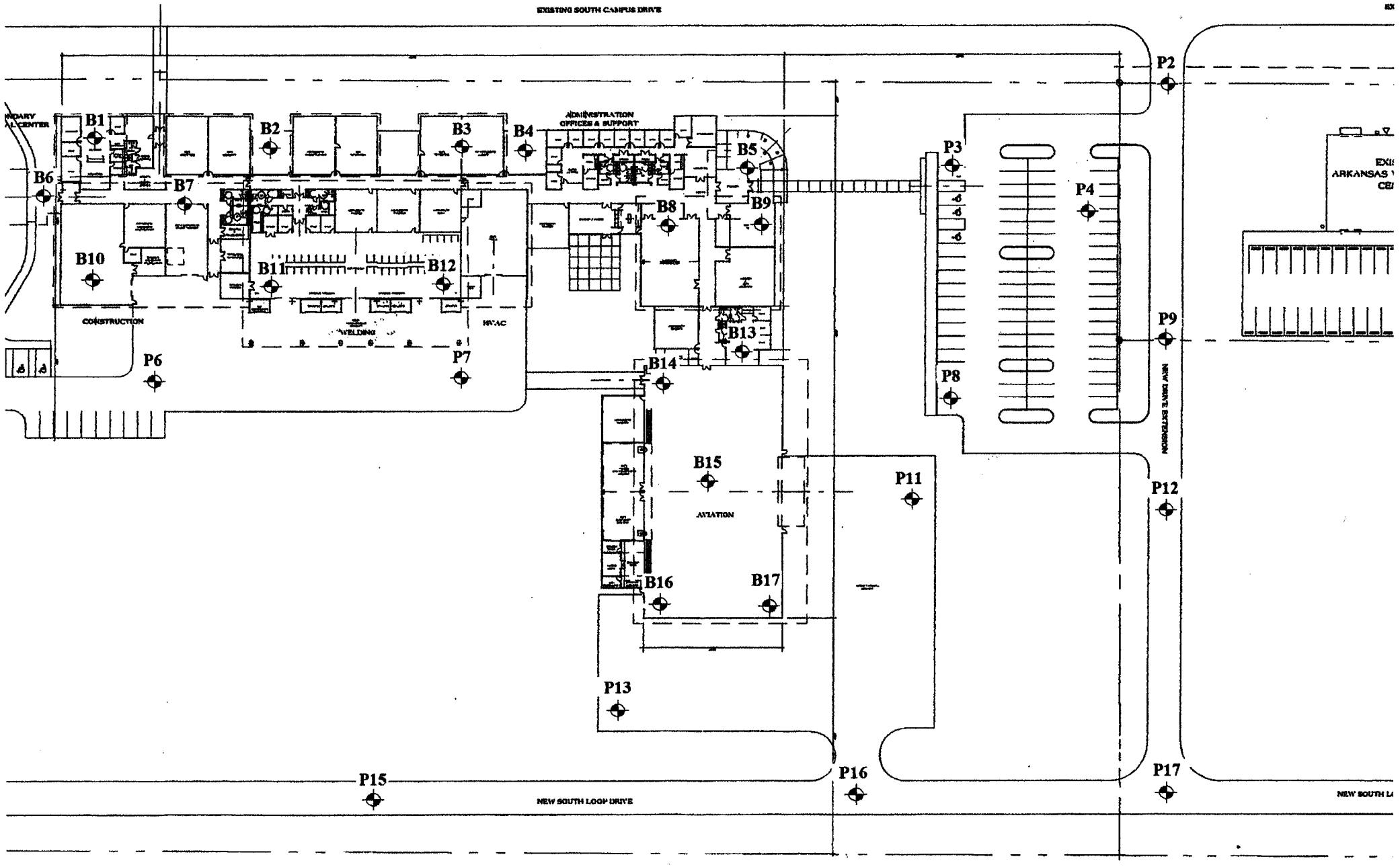
# APPENDIX A

# PLATES

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# VICINITY MAP

# BLYTHEVILLE, ARKANSAS




# PLAN OF BC

## ARKANSAS NORTHEA
## NEW ALLIED TECHN

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B1

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 01/08/16 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** OWENS **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 6 | | SOFT TO MEDIUM STIFF MOIST DARK BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 5 | | CONTINUES (CL) - BECOMES GRAYISH BROWN<br>PP = 0.50 TSF |
| | P4 | 5 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 10 | P5 | 4 | | PP = 0.50 TSF |
| 15 | P6 | 3 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 7.5 FEET DURING DRILLING.<br>WATER LEVEL AT 17.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B2
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/08/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA
CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | PP = 1.00 TSF |
| 5 | P3 | 7 | | PP = 0.75 TSF |
| | P4 | 5 | | PP = 0.50 TSF |
| 10 | P5 | 5 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.50 TSF |
| | | | | ▼ |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME WET GRAY<br>PP = 0.50 TSF |
| | | | | ▽ |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 13.5 FEET DURING DRILLING.<br>WATER LEVEL AT 20.0 FEET UPON COMPLETION OF DRILLING. |
| 25 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B3
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/08/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No. | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 5 | | PP = 0.50 TSF |
| 5 | P3 | 6 | | PP = 0.75 TSF |
| | P4 | 5 | | PP = 0.50 TSF |
| 10 | P5 | 4 | | CONTINUES (CL) - BECOMES WET BROWNISH GRAY<br>PP = 0.50 TSF |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 9.5 FEET DURING DRILLING.<br>WATER LEVEL AT 9.5 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B4
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/08/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA
CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 6 | | SOFT TO MEDIUM STIFF MOIST DARK BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 8 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 7 | | CONTINUES (CL) - BECOMES GRAYISH BROWN<br>PP = 0.50 TSF |
| | P4 | 6 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 10 | P5 | 5 | | PP = 0.50 TSF |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>STANDING WATER DUE TO RECENT RAIN.<br>WATER LEVEL AT 19.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B5

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 12/21/15 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** MURRAY **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 4 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 6 | | PP = 0.75 TSF |
| | P4 | 5 | | CONTINUES (CL)<br>PP = 0.50 TSF |
| 10 | P5 | 5 | | PP = 0.50 TSF |
| 15 | P6 | 3 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 2 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.25 TSF |
| | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>STANDING WATER DUE TO RECENT RAIN.<br>WATER LEVEL AT 20.0 FEET UPON COMPLETION OF DRILLING. |
| 25 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B6
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 6 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 6 | | CONTINUES (CL) - BECOMES BROWN<br>PP = 0.75 TSF |
| | P4 | 6 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.75 TSF |
| 10 | P5 | 3 | | PP = 0.50 TSF |
| 15 | P6 | 5 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>STANDING WATER DUE TO RECENT RAIN.<br>WATER ENCOUNTERED AT 6.0 FEET DURING DRILLING.<br>WATER LEVEL AT 4.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B7

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 12/21/15 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** MURRAY **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL)<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 1.00 TSF |
| 5 | P3 | 8 | | PP = 1.00 TSF |
| | P4 | 5 | | PP = 0.50 TSF |
| 10 | P5 | 4 | | PP = 0.50 TSF |
| 15 | P6 | 3 | | CONTINUES (CL) - BECOME WET GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 10.0 FEET DURING DRILLING.<br>WATER LEVEL AT 10.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B8

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 01/12/16 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** OWENS **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 10 | | SOFT TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 1.00 TSF |
| | P2 | 9 | | PP = 1.00 TSF |
| 5 | P3 | 7 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.75 TSF |
| | P4 | 6 | | PP = 0.75 TSF |
| 10 | P5 | 4 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 15 | P6 | 2 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.25 TSF |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>STANDING ENCOUNTERED AT 7.5 FEET DURING DRILLING.<br>WATER LEVEL AT 7.5 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B9

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 12/21/15 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** MURRAY **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth in Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 10 | | CONTINUES (CL) - BECOMES DARK BROWN<br>PP = 1.00 TSF |
| | P4 | 8 | | PP = 1.00 TSF |
| 10 | P5 | 6 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.75 TSF |
| 15 | P6 | 5 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 25 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B10

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 12/21/15 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** MURRAY **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 4 | | SOFT TO STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS) - BECOMES BROWN<br>PP = 0.75 TSF |
| 5 | P3 | 9 | | PP = 1.00 TSF |
| | P4 | 4 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 10 | P5 | 3 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.50 TSF |
| 15 | P6 | 3 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 8.5 FEET DURING DRILLING.<br>WATER LEVEL AT 5.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B11
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/08/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 3 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 7 | | PP = 0.75 TSF |
| | P4 | 4 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 10 | P5 | 4 | | PP = 0.50 TSF |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME WET GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 7.5 FEET DURING DRILLING.<br>WATER LEVEL AT 7.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B12
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/12/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 4 | | SOFT TO MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 1.00 TSF |
| 5 | P3 | 6 | | PP = 0.75 TSF |
| | P4 | 5 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 10 | P5 | 4 | | PP = 0.50 TSF |
| 15 | P6 | 3 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 6.5 FEET DURING DRILLING.<br>WATER LEVEL AT 5.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B13
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 1.00 TSF |
| 5 | P3 | 7 | | PP = 0.75 TSF |
| | P4 | 7 | | PP = 0.75 TSF |
| 10 | P5 | 5 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 2 | | PP = 0.25 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 10.0 FEET DURING DRILLING..<br>WATER LEVEL AT 1.5 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B14
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 0.75 TSF |
| 5 | P3 | 5 | | CONTINUES (CL) - BECOMES GRAYISH BROWN<br>PP = 0.50 TSF |
| | P4 | 4 | | PP = 0.50 TSF |
| 10 | P5 | 3 | ▼ | PP = 0.50 TSF |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME WET GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 4 | ▽ | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 10.5 FEET DURING DRILLING.<br>WATER LEVEL AT 20.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B15
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) (NO ORGANICS) - BECOMES GRAYISH BROWN<br>PP = 1.00 TSF |
| 5 | P3 | 9 | | PP = 1.00 TSF |
| | P4 | 6 | | PP = 0.75 TSF |
| 10 | P5 | 7 | ▽ | PP = 0.75 TSF |
| 15 | P6 | 3 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 11.0 FEET DURING DRILLING.<br>WATER LEVEL AT 11.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** B16
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) (NO ORGANICS)<br>PP = 1.00 TSF |
| 5 | P3 | 7 | | PP = 0.75 TSF |
| | P4 | 5 | | PP = 0.50 TSF |
| 10 | P5 | 4 | | PP = 0.50 TSF |
| 15 | P6 | 4 | | CONTINUES (CL) - BECOME WET GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 3 | | PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 11.0 FEET DURING DRILLING.<br>WATER LEVEL AT 15.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
10205 ROCKWOOD ROAD, LITTLE ROCK, ARKANSAS 72204

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS **BORING NO:** B17

**FOR:** ARKANSAS NORTHEASTERN COLLEGE **LOCATION:** SEE PLAN OF BORINGS

**DATE:** 12/21/15 **JOB NO:** 450015 **BORING TYPE:** AUGER W/SPT

**DRILLER:** TARENA CME 45 ATV **GEOTECHNICIAN:** MURRAY **GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO STIFF MOIST DARK BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 10 | | CONTINUES (CL) (NO ORGANICS) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| 5 | P3 | 8 | | PP = 1.00 TSF |
| | P4 | 7 | | PP = 0.75 TSF |
| 10 | P5 | 5 | | PP = 0.50 TSF |
| 15 | P6 | 5 | | CONTINUES (CL) - BECOME GRAY<br>PP = 0.50 TSF |
| 20 | P7 | 4 | | CONTINUES (CL) - BECOMES WET<br>PP = 0.50 TSF |
| 25 | | | | BOTTOM OF HOLE AT 21.5 FEET.<br>BORING REMAINED OPEN.<br>WATER ENCOUNTERED AT 19.0 FEET DURING DRILLING.<br>WATER LEVEL AT 17.0 FEET UPON COMPLETION OF DRILLING. |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P1
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 8 | | MEDIUM STIFF TO STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 1.00 TSF |
| | P2 | 9 | | PP = 1.00 TSF |
| 5 | P3 | 5 | | PP = 0.50 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P2
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 7 | | MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 8 | | PP = 1.00 TSF |
| 5 | P3 | 6 | | PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P3
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | PP = 0.75 TSF |
| 5 | P3 | 7 | | PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P4
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

| | | | | |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 9 | | PP = 1.00 TSF |
| 5 | P3 | 9 | | PP = 1.00 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P5
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 4 | | SOFT TO MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 6 | | PP = 0.75 TSF |
| 5 | P3 | 5 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.50 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P6
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/12/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

| | | | | |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | PP = 0.75 TSF |
| 5 | P3 | 10 | | PP = 1.00 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P7
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/12/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 6 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 9 | | PP = 1.00 TSF |
| 5 | P3 | 7 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P8
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 11 | | PP = 1.25 TSF |
| 5 | P3 | 10 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P9
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 6 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 7 | | PP = 0.75 TSF |
| 5 | P3 | 9 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P10
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 4 | | SOFT TO MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 7 | | CONTINUES (CL) - BECOMES BROWN<br>PP = 0.75 TSF |
| 5 | P3 | 6 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P11
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| 5 | P3 | 6 | | PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P12
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 9 | | STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 1.00 TSF |
| | P2 | 9 | | PP = 1.00 TSF |
| 5 | P3 | 10 | | PP = 1.00 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P13
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 01/11/16
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** OWENS
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 10 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| 5 | P3 | 5 | | PP = 0.50 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P14
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

| | | | | |
|---|---|---|---|---|
| 0 | P1 | 6 | | MEDIUM STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 8 | | CONTINUES (CL) - BECOMES BROWN<br>PP = 1.00 TSF |
| 5 | P3 | 6 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P15
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 6 | | MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.75 TSF |
| | P2 | 8 | | PP = 1.00 TSF |
| 5 | P3 | 6 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P16
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | SOFT TO MEDIUM STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 8 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| 5 | P3 | 4 | | PP = 0.50 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P17
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

LEGEND

S Shelby Tube | NV Diamond Core | P Penetration Test
Core | Standard Penetration | J - Jar
Static Water Table | Hydrostatic Water Table | No Recovery

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 5 | | MEDIUM STIFF TO STIFF MOIST BROWN SILTY CLAY (CL) WITH ORGANICS<br>PP = 0.50 TSF |
| | P2 | 9 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| 5 | P3 | 5 | | PP = 0.50 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

# LOG OF BORING

**PROJECT:** ARKANSAS NORTHEASTERN COLLEGE - NEW ALLIED TECH CENTER - BLYTHEVILLE, ARKANSAS
**BORING NO:** P18
**FOR:** ARKANSAS NORTHEASTERN COLLEGE
**LOCATION:** SEE PLAN OF BORINGS
**DATE:** 12/21/15
**JOB NO:** 450015
**BORING TYPE:** AUGER W/SPT
**DRILLER:** TARENA CME 45 ATV
**GEOTECHNICIAN:** MURRAY
**GROUND ELEVATION:** NOT FURNISHED

| Depth In Feet | Sample Type & No | N-Blows Per Foot | Graphic Symbol | VISUAL DESCRIPTION OF STRATUM |
|---|---|---|---|---|
| 0 | P1 | 8 | | MEDIUM STIFF TO STIFF MOIST BROWNISH GRAY SILTY CLAY (CL) WITH ORGANICS<br>PP = 1.00 TSF |
| | P2 | 9 | | CONTINUES (CL) - BECOMES BROWNISH GRAY<br>PP = 1.00 TSF |
| 5 | P3 | 7 | | PP = 0.75 TSF |
| | | | | BOTTOM OF HOLE AT 6.5 FEET.<br>BORING REMAINED OPEN.<br>NO WATER WAS ENCOUNTERED IN THIS BORING. |
| 10 | | | | |

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# FIELD CLASSIFICATION SYSTEM
# FOR SOIL EXPLORATION

## NON COHESIVE SOILS

(Silt, Sand, Gravel and Combinations)

**Density**

| | |
|---|---|
| Very Loose | - 0 - 4 blows/ft. |
| Loose | - 4 to 10 blows/ft. |
| Medium Dense | - 10 to 30 blows/ft. |
| Dense | - 30 to 50 blows/ft. |
| Very Dense | - over 50 |

**Relative Proportions**

| Descriptive Term | Percent |
|---|---|
| Trace | 1 - 10 |
| Little | 11 - 20 |
| Some | 21 - 35 |
| And | 36 - 50 |

**Particle Size Identification**

| | | |
|---|---|---|
| Boulders | - | 8-inch diameter or more |
| Cobbles | - | 3 to 8-inch diameter |
| Gravel | - Coarse | - 1 to 3-inch |
| | Medium | - ½ to 1-inch |
| | Fine | - ¼ to ½-inch |
| Sand | - Coarse | - 0.6 mm to ¼-inch (dia. of pencil lead) |
| | Medium | - 0.2 mm to 0.6 mm (dia. of broom straw) |
| | Fine | - 0.05 mm to 0.2 mm (dia. of human hair) |
| Silt | | - 0.06 mm to 0.002 mm (Cannot see particles) |

## COHESIVE SOILS

(Clay, Silt and Combinations)

**Consistency**

| | |
|---|---|
| Very Soft | - <2 blows/ft |
| Soft | - 2 to 4 blows/ft. |
| Medium Stiff | - 4 to 8 blows/ft. |
| Stiff | - 8 to 15 blows/ft. |
| Very Stiff | - 15 to 30 blows/ft. |
| Hard | - over 30 |

**Plasticity**

| Degree of Plasticity | Plasticity Index |
|---|---|
| None to slight | 0 - 4 |
| Slight | 5 - 7 |
| Medium | 8 - 22 |
| High to Very High | over 22 |

## NOTES

**Classification** on logs are made by visual inspection.

**Standard Penetration Test** - Driving a 2.0-inch O.D., 1⅜-inch I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140-pound hammer free falling a distance of 30.0 inches. It is customary for AECI to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (Example: 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e., 8 + 9 = 17 blows/ft.).

**Strata Changes** - In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (——) represents an actually observed change, a dashed line (- - - -) represents an estimated change.

**Groundwater** observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# KEY TO SOIL CLASSIFICATIONS AND SYMBOLS

## UNIFIED SOIL CLASSIFICATION SYSTEM(1)

| Major Divisions | | Letter | Symbol: Hatching | Symbol: Color | Name |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS | GRAVEL AND GRAVELLY SOILS | GW | | RED | Well-graded gravels or gravel-sand mixtures, little or no fines |
| | | GP | | | Poorly-graded gravels or gravel-sand mixtures, little or no fines |
| | | GM | | YELLOW | Silty gravels, gravel-sand-silt mixtures |
| | | GC | | | Clayey gravels, gravel-sand-clay mixtures |
| | SAND AND SANDY SOILS | SW | | RED | Well-graded sands or gravelly sands, little or no fines |
| | | SP | | | Poorly-graded sands or gravelly sands, little or no fines |
| | | SM | | YELLOW | Silty sands, sand-silt mixtures |
| | | SC | | | Clayey sands, sand-clay mixtures |
| FINE GRAINED SOILS | SILTS AND CLAYS LL<50 | ML | | GREEN | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| | | CL | | | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | OL | | | Organic silts and organic silt-clays of low plasticity |
| | SILTS AND CLAYS LL>50 | MH | | BLUE | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | CH | | | Inorganic clays of high plasticity, fat clays |
| | | OH | | | Organic clays of medium to high plasticity, organic silts |
| HIGHLY ORGANIC SOILS | | Pt | | ORANGE | Peat and other highly organic soils |

## TERMS CHARACTERIZING SOIL STRUCTURE(2)

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance.

FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.

LAMINATED (VARVED) - composed of thin layers of varying color and texture, usually grading from sand or silt at the bottom to clay at the top.

CRUMBLY - cohesive soils which break into small blocks or crumbs on drying.

CALCAREOUS - containing appreciable quantities of calcium carbonate, generally nodular.

WELL GRADED - having wide range in grain sizes and substantial amounts of all intermediate particle sizes.

POORLY GRADED - predominantly of one grain size (uniformly graded) or having a range of sizes with some intermediate size missing (gap or skip graded).

## SYMBOLS FOR TEST DATA

M/C = 15 - Natural moisture content in percent.
$\gamma$ = 95 - Dry unit weight in pounds/cubic foot.
Qu = 1.23 - Unconfined compression strength in tons/square foot.
Qc = 1.68 (21 psi) - Confined compression strength at indicated lateral pressure.
51-21-30 - Liquid limit, Plastic limit, and Plasticity index.
30% FINER - Percent finer than No. 200 mesh sieve.
30 B/F - Blows per foot, Standard Penetration test.
▼ - Hydrostatic water table.
▽ - Static water table.

## TERMS DESCRIBING CONSISTENCY OF SOILS(2)

| COARSE GRAINED SOILS | | FINE GRAINED SOILS | | |
|---|---|---|---|---|
| DESCRIPTIVE TERM | NO. BLOWS/FOOT STANDARD PEN. TEST | DESCRIPTIVE TERM | NO. BLOWS/FOOT STANDARD PEN. TEST | UNCONFINED COMPRESSION TONS PER SQ. FT. |
| Very Loose | 0 - 4 | Very Soft | <2 | <0.25 |
| Loose | 4 - 10 | Soft | 2 - 4 | 0.25 - 0.50 |
| Firm (medium dense) | 10 - 30 | Plastic (medium stiff) | 4 - 8 | 0.50 - 1.00 |
| Dense | 30 - 50 | Stiff | 8 - 15 | 1.00 - 2.00 |
| Very Dense | over 50 | Very Stiff | 15 - 30 | 2.00 - 4.00 |
| | | Hard | over 30 | over 4.00 |

Field classification for "Consistency" is determined with a 0.25-inch diameter penetrometer.

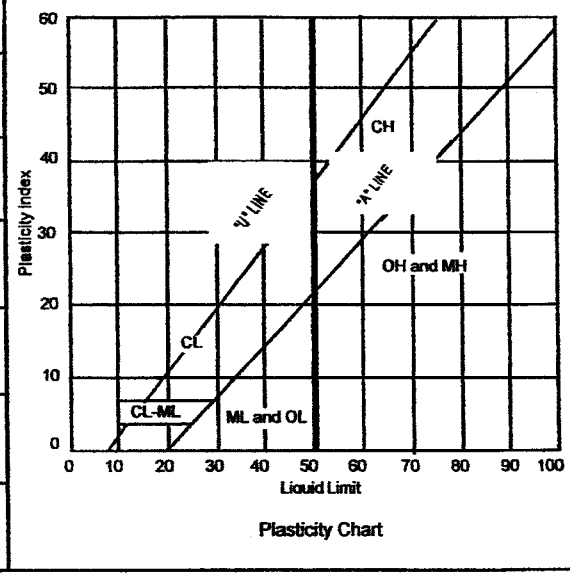
(1) - From Waterways Experiment Station Technical Memorandum No. 3-357

(2) - From "Soil Mechanics in Engineering Practice" by Terzaghi and Peck

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# UNIFIED SOIL CLASSIFICATION SYSTEM

## (ASTM D 2487)

| Major divisions | | | Group Symbols | Typical Names | Laboratory Classifications Criteria | | |
|---|---|---|---|---|---|---|---|
| Coarse-grained soils (More than half of material is larger than No. 200 sieve size) | Gravels (more than half of coarse fraction is larger than No. 4 sieve size) | Clean gravels (Little or no fines) | GW | Well-graded gravels, gravel-sand mixtures, little or no fines | Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent ..... GW, GP, SW, SP<br>More than 12 percent ..... GM, GC, SM, SC<br>5 to 12 percent ..... Borderline cases requiring dual symbols ** | $C_u = \frac{D_{60}}{D_{10}}$ Greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 | |
| | | | GP | Poorly graded gravels, gravel-sand mixtures, little or no fines | | Not meeting all gradation requirements for GW | |
| | | Gravels with fines (Appreciable amount of fines) | GM* d | Silty gravels, gravel-sand-silt mixtures | | Atterberg limits below "A" line or P.I. less than 4 | Above "A" line with P.I. Between 4 and 7 are borderline cases requiring use of dual symbols |
| | | | GM* u | | | | |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures | | Atterberg limits above "A" line with P.I. greater than 7 | |
| | Sands (More than half of coarse fraction is smaller than No. 4 sieve size) | Clean sands (Little or no fines) | SW | Well-graded sands, gravelly sands, little or no fines | | $C_u = \frac{D_{60}}{D_{10}}$ Greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 | |
| | | | SP | Poorly graded sands, gravelly sands, little or no fines | | Not meeting all gradation requirements for SW | |
| | | Sands with fines (Appreciable amount of fines) | SM* d | Silty sands, sand-silt mixtures | | Atterberg limits below "A" line or P.I. less than 4 | Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols |
| | | | SM* u | | | | |
| | | | SC | Clayey sands, sand-clay mixtures | | Atterberg limits above "A" line with P.I. greater than 7 | |
| Fine-grained soils (More than half of material is smaller than No. 200 sieve) | Silts and clays (Liquid limit less than 50) | | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity |  | |
| | | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays | | | |
| | | | OL | Organic silts and organic silty clays of low plasticity | | | |
| | Silts and clays (Liquid limit greater than 50) | | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts | | | |
| | | | CH | Inorganic clays of high plasticity, fat clays | | | |
| | | | OH | Organic clays of medium to high plasticity, organic silts | | | |
| | Highly Organic soils | | Pt | Peat and other highly organic soils | Plasticity Chart | | |

*Division of GM and SM groups into subdivisions of d and u are for roads and airfield only. Subdivision is based on Atterberg limits; suffix d used when L.L. is 28 or less and the P.I. is 6 or less; u used when L.L. is greater than 24.
**Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# Design Calculations for Conventional Footings

PROJECT: Arkansas Northeastern College-New Allied Technologies Center
PROJECT NO.: 450015 DATE: 1/4/2015
BORING NO.: Average TESTED BY: AECI SAFETY FACTOR: 2.00

| Df ft | Depth from | - ft. to | STRATA H - ft | N B/F | Qu KSF | Qu/2 KSF | 1.25Qu KSF | .125Df KSF | Qa KSF |
|---|---|---|---|---|---|---|---|---|---|
| 1.5 | 0.0 | 1.5 | 1.5 | 6 | 1.6 | 0.8 | 2.0 | 0.188 | 1.1 |
| 4.0 | 1.5 | 4.0 | 2.5 | 8 | 2.1 | 1.1 | 2.7 | 0.500 | 1.6 |
| 6.5 | 4.0 | 6.5 | 2.5 | 6 | 1.6 | 0.8 | 2.0 | 0.813 | 1.3 |
| 9.0 | 6.5 | 9.0 | 2.5 | 6 | 1.6 | 0.8 | 2.0 | 1.125 | 1.4 |
| 11.5 | 9.0 | 11.5 | 2.5 | 5 | 1.3 | 0.7 | 1.7 | 1.438 | 1.3 |
| 16.5 | 11.5 | 16.5 | 5.0 | 4 | 1.1 | 0.5 | 1.4 | 2.063 | 1.3 |
| 21.5 | 16.5 | 21.5 | 5.0 | 3 | 0.8 | 0.4 | 1.0 | 2.688 | 1.3 |

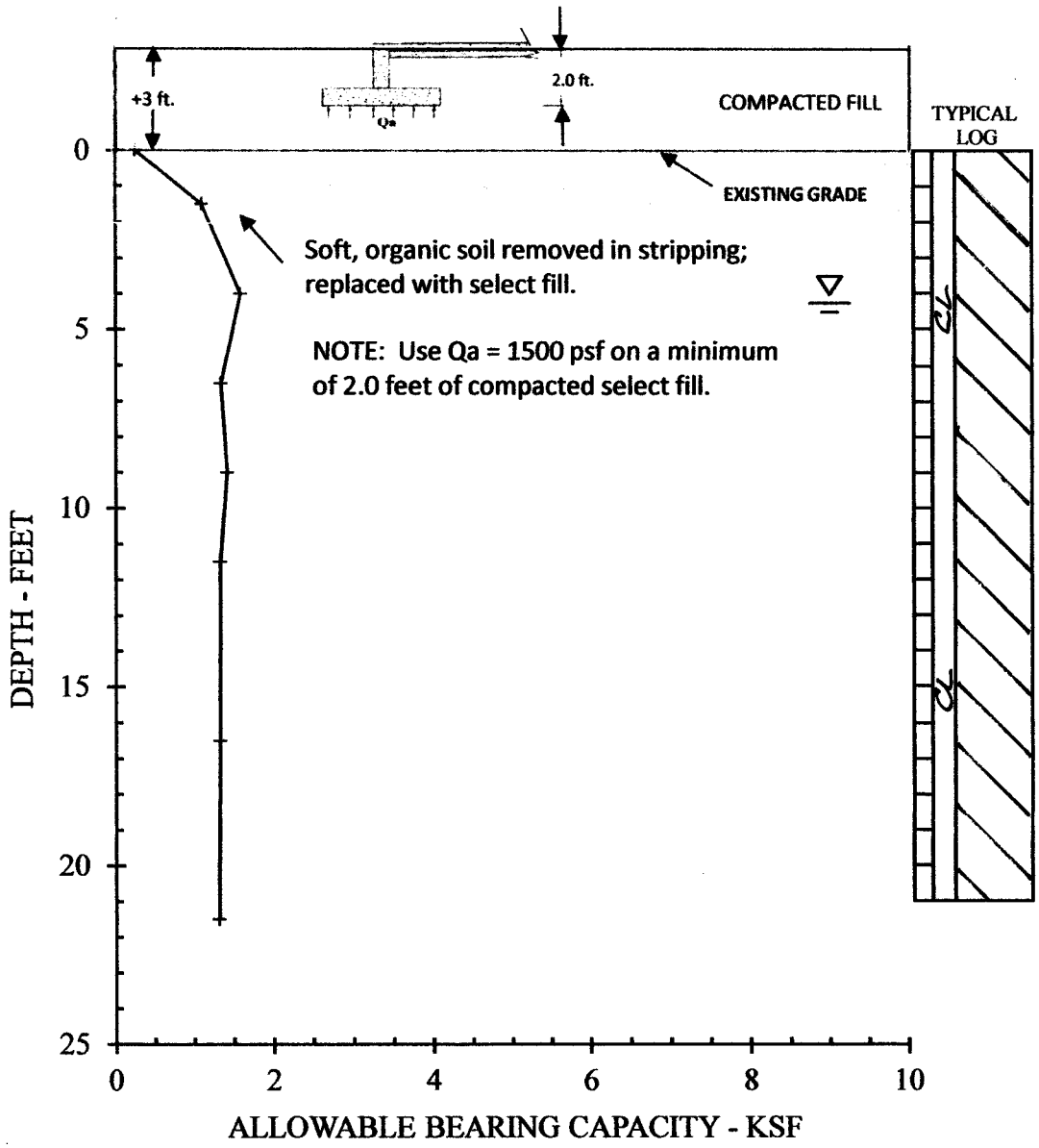
WATER TABLE LEVEL: 4.0 ft.

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# CONVENTIONAL FOOTINGS

PROJECT: **Arkansas Northeastern College-New Allied Technolo** BORING NO.: **Average**
**Blytheville, Arkansas**

PROJECT NO.: **450015** WATER TABLE: **4.0 ft.** SAFETY FACTOR: **2.00**

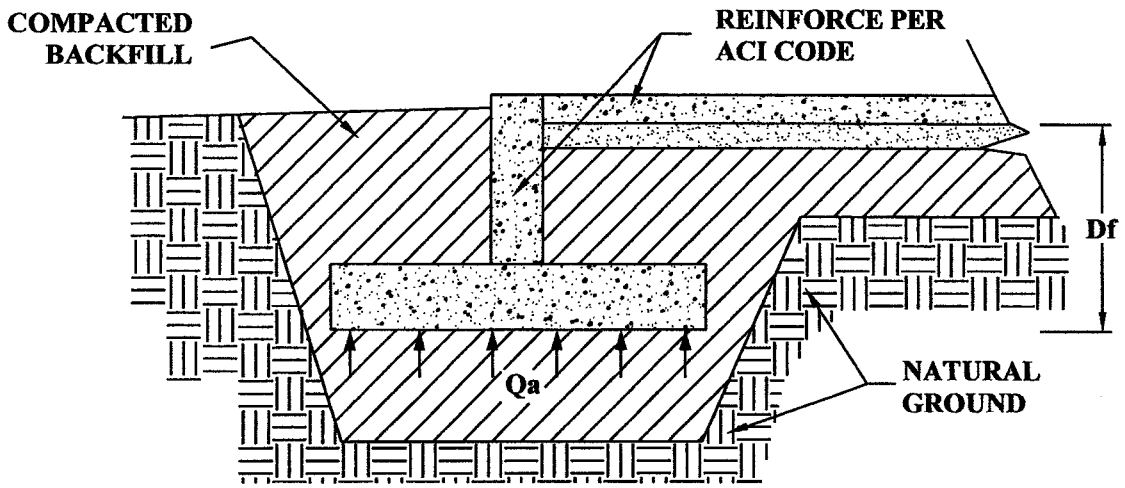



## DEPTH - BEARING CAPACITY CURVE

AECI COPYRIGHT © 2016

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# CONVENTIONAL FOOTINGS
## (ON SELECT FILL)




## Explanation of Calculations Shown in Tables

$D_f$ = Depth from ground surface to bottom of footing (feet)

Depth = Depth from top to bottom of soil strata (feet)

Strata H = Thickness of soil strata (feet)

N = Standard penetration N-value (blows per foot)

$Q_u$ = Ultimate soil strength (ksf)

1.25 $Q_u$ = Soil Strength parameter (ksf)

0.125 $D_f$ = Depth factor (ksf)

$Q_a$ = Allowable bearing capacity = (1.25 $Q_u$ + 0.125 $D_f$) ÷ Safety Factor (ksf)

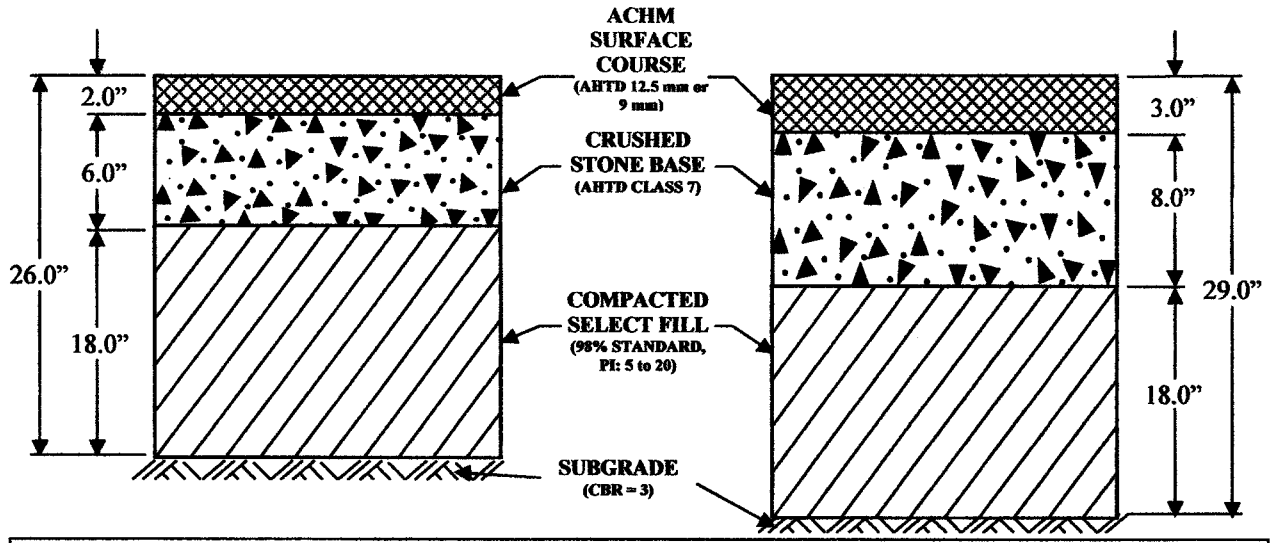
# EXPLANATION OF BEARING CAPACITY CALCULATIONS

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# RECOMMENDED FLEXIBLE PAVEMENT STRUCTURE

## LIGHT TRAFFIC

## HEAVY TRAFFIC

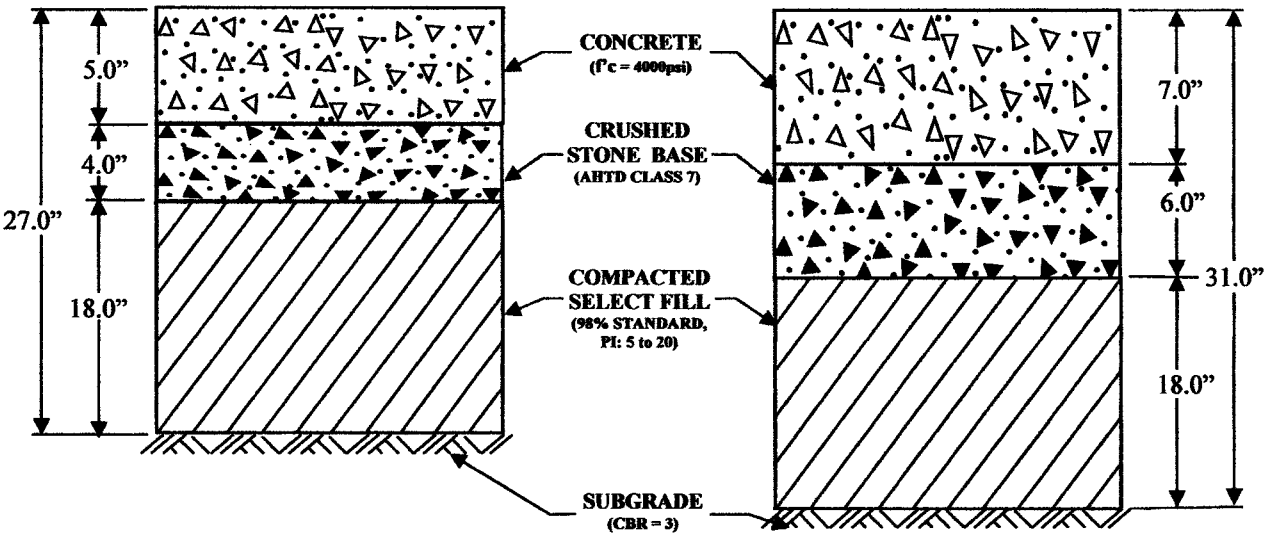



NOTE: Slag may be substituted for Class 7 stone with the addition of 2.0 inches of material.

# RECOMMENDED RIGID PAVEMENT STRUCTURE

## LIGHT TRAFFIC

## HEAVY TRAFFIC




NOTE: Slag may be substituted for Class 7 stone with the addition of 2.0 inches of material.

# APPENDIX B

# SUPPORTING LABORATORY DATA

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# MOISTURE CONTENT DETERMINATION
## ASTM D 2216

**Project:** Arkansas Northeastern College - New Allied Tech Center **Project No.:** 450015
**Location:** Blytheville, Arkansas **Date:** 01/21/16

| MOISTURE CONTENT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Number | B1;P2 | B2;P2 | B4;P1 | B4;P2 | B5;P5 | B9;P3 | B10;P1 |
| Tare Number | A | B | C | D | E | F | G |
| Tare + Wet Soil (g) | 700.1 | 810.70 | 709.50 | 580.40 | 946.10 | 808.70 | 447.80 |
| Tare + Dry Soil (g) | 587.50 | 687.80 | 621.50 | 517.20 | 749.60 | 677.30 | 396.80 |
| Tare (g) | 142.30 | 231.80 | 326.10 | 303.80 | 261.8 | 233.20 | 186.20 |
| Water (g) | 112.60 | 122.90 | 88.00 | 63.20 | 196.50 | 131.40 | 51.00 |
| Dry Soil (g) | 445.20 | 456.00 | 295.40 | 213.40 | 487.80 | 444.10 | 210.60 |
| Water Content (%) | **25.29** | **26.95** | **29.79** | **29.62** | **40.28** | **29.59** | **24.22** |

| MOISTURE CONTENT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Number | B13;P3 | B14;P4 | B17;P2 | P1;P2 | B6;P3 | P8;P2 | P12;P1 |
| Tare Number | H | I | J | K | L | M | N |
| Tare + Wet Soil (g) | 743.50 | 913.80 | 628.00 | 906.30 | 886.7 | 771.20 | 610.50 |
| Tare + Dry Soil (g) | 633.50 | 735.20 | 564.20 | 783.70 | 782 | 665.90 | 557.80 |
| Tare (g) | 247.30 | 240.80 | 369.60 | 333.80 | 396.4 | 293.40 | 329.20 |
| Water (g) | 110.00 | 178.60 | 63.80 | 122.60 | 104.70 | 105.30 | 52.70 |
| Dry Soil (g) | 386.20 | 494.40 | 194.60 | 449.90 | 385.60 | 372.50 | 228.60 |
| Water Content (%) | **28.48** | **36.12** | **32.79** | **27.25** | **27.15** | **28.27** | **23.05** |

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# ATTERBERG LIMIT DETERMINATION
## ASTM D 4318

**Project:** Arkansas Northeastern College - New Allied Tech Center **Project No.:** 450015
**Location:** Blytheville, Arkansas **Date:** 01/25/16

| LIQUID LIMIT | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample Number | B1;P2 | B3;P4 | B4;P1 | B4;P2 | B5;P5 | B6;P3 | B10;P1 |
| Tare Number | 110 | 41 | 43 | 7 | 3 | 3A | 33 |
| Number of Blows | 25 | 26 | 27 | 24 | 25 | 25 | 27 |
| Tare + Wet Soil (g) | 53.6 | 42.95 | 45.33 | 43.96 | 45.46 | 48.57 | 41.36 |
| Tare + Dry Soil (g) | 45.10 | 34.06 | 37.38 | 35.48 | 34.53 | 40.86 | 35.49 |
| Tare (g) | 16.43 | 13.40 | 12.81 | 16.30 | 13.57 | 14.73 | 15.34 |
| Water (g) | 8.50 | 8.89 | 7.95 | 8.48 | 10.93 | 7.71 | 5.89 |
| Dry Soil (g) | 28.67 | 20.66 | 24.57 | 19.18 | 20.96 | 26.13 | 20.15 |
| Water Content (%) | 29.65 | 43.03 | 32.36 | 44.21 | 52.15 | 29.51 | 29.23 |
| Liquid Limit | 30 | 43 | 33 | 44 | 52 | 30 | 30 |
| **PLASTIC LIMIT** | | | | | | | |
| Sample Number | B1;P2 | B3;P4 | B4;P1 | B4;P2 | B5;P5 | B6;P3 | B10;P1 |
| Tare Number | 122 | 81 | 48 | 413 | 4 | 105 | 14 |
| Tare + Wet Soil (g) | 23.51 | 23.91 | 23.13 | 25.36 | 24.94 | 23.07 | 23.94 |
| Tare + Dry Soil (g) | 21.76 | 22.24 | 21.54 | 23.83 | 23.21 | 21.26 | 22.31 |
| Tare (g) | 13.29 | 13.81 | 12.94 | 15.14 | 14.85 | 12.89 | 13.72 |
| Water (g) | 1.75 | 1.67 | 1.59 | 1.53 | 1.73 | 1.81 | 1.63 |
| Dry Soil (g) | 8.47 | 8.43 | 8.60 | 8.69 | 8.36 | 8.37 | 8.59 |
| Water Content (%) | 20.66 | 19.81 | 18.49 | 17.61 | 20.69 | 21.62 | 18.98 |
| Plastic Limit | 21 | 20 | 18 | 18 | 21 | 22 | 19 |
| Plasticity Index | **9** | **23** | **15** | **26** | **31** | **8** | **11** |
| Classification (#40) | CL | CL | CL | CL | CH | CL | CL |
| **LIQUID LIMIT** | | | | | | | |
| Sample Number | B13;P3 | B15;P7 | B16;P5 | B17;P2 | P4;P3 | P6;P3 | P12;P1 |
| Tare Number | 41 | 51 | 501 | 10 | 503 | 18 | 30 |
| Number of Blows | 23 | 24 | 27 | 27 | 23 | 24 | 23 |
| Tare + Wet Soil (g) | 43.70 | 37.96 | 48.63 | 47.53 | 42.30 | 39.87 | 45.63 |
| Tare + Dry Soil (g) | 35.11 | 31.60 | 40.56 | 38.25 | 34.95 | 34.51 | 36.59 |
| Tare (g) | 14.17 | 16.10 | 19.46 | 20.60 | 19.43 | 14.78 | 12.79 |
| Water (g) | 8.59 | 6.36 | 8.07 | 9.28 | 7.35 | 5.36 | 9.04 |
| Dry Soil (g) | 20.94 | 15.50 | 21.10 | 17.65 | 15.52 | 19.73 | 23.80 |
| Water Content (%) | 41.02 | 41.03 | 38.25 | 52.58 | 47.36 | 27.17 | 37.98 |
| Liquid Limit | 41 | 41 | 39 | 53 | 47 | 27 | 38 |
| **PLASTIC LIMIT** | | | | | | | |
| Sample Number | B13;P3 | B15;P7 | B16;P5 | B17;P2 | P4;P3 | P6;P3 | P12;P1 |
| Tare Number | 17 | 63 | 502 | 412 | 509 | 37 | 209 |
| Tare + Wet Soil (g) | 25.19 | 25.06 | 29.74 | 30.16 | 30.11 | 25.51 | 25.40 |
| Tare + Dry Soil (g) | 23.46 | 23.43 | 27.92 | 28.21 | 28.39 | 23.81 | 23.78 |
| Tare (g) | 15.13 | 14.82 | 19.25 | 19.98 | 19.79 | 15.33 | 15.24 |
| Water (g) | 1.73 | 1.63 | 1.82 | 1.95 | 1.72 | 1.70 | 1.62 |
| Dry Soil (g) | 8.33 | 8.61 | 8.67 | 8.23 | 8.60 | 8.48 | 8.54 |
| Water Content (%) | 20.77 | 18.93 | 20.99 | 23.69 | 20.00 | 20.05 | 18.97 |
| Plastic Limit | 21 | 19 | 21 | 24 | 20 | 20 | 19 |
| Plasticity Index | **20** | **22** | **18** | **29** | **27** | **7** | **19** |
| Classification (#40) | CL | CL | CL | CH | CL | CL | CL |

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# ATTERBERG LIMIT DETERMINATION
## ASTM D 4318

**Project:** Arkansas Northeastern College - New Allied Tech Center **Project No.:** 450015
**Location:** Blytheville, Arkansas **Date:** 01/25/16

| LIQUID LIMIT | |
|---|---|
| Sample Number | B18;P2 |
| Tare Number | 39 |
| Number of Blows | 26 |
| Tare + Wet Soil (g) | 42.07 |
| Tare + Dry Soil (g) | 34.99 |
| Tare (g) | 13.18 |
| Water (g) | 7.08 |
| Dry Soil (g) | 21.81 |
| Water Content (%) | 32.46 |
| Liquid Limit | 33 |

| PLASTIC LIMIT | |
|---|---|
| Sample Number | B18;P2 |
| Tare Number | 216 |
| Tare + Wet Soil (g) | 25.66 |
| Tare + Dry Soil (g) | 24.00 |
| Tare (g) | 15.37 |
| Water (g) | 1.66 |
| Dry Soil (g) | 8.63 |
| Water Content (%) | 19.24 |
| Plastic Limit | 19 |
| Plasticity Index | **14** |
| Classification (#40) | CL |

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# MECHANICAL GRAIN SIZE ANALYSES
# ASTM D 422 & D 1140

**Project:** Ark. NE College - New Allied Tech Center
**Location:** Blytheville, Arkansas
**Sample No.:** B2;P2
**Soil Description:** Silty clay
**Project No.:** 450015
**Date:** 01/25/16
**Sample Depth:** 2.5'-4.0'

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 3.8 | 3.8 | 0.8 | 99.2 |
| #10 | 4.1 | 7.9 | 1.7 | 98.3 |
| #40 | 5.3 | 13.2 | 2.9 | 97.1 |
| #200 | 9.6 | 22.8 | 5.0 | 95.0 |
| PAN | 433.2 | 456.0 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.8
**Percent Sample Sand:** 4.2
**Percent Sample Silt/Clay:** 95.0
**Sample Weight:** 456.0g
**Washing Loss:** 433.2g

**Project:** Ark. NE College - New Allied Tech Center
**Location:** Blytheville, Arkansas
**Sample No.:** B5;P5
**Soil Description:** Silty clay
**Project No.:** 450015
**Date:** 01/25/16
**Sample Depth:** 10.0'-11.5

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 0.0 | 0.0 | 0.0 | 100.0 |
| #10 | 0.0 | 0.0 | 0.0 | 100.0 |
| #40 | 0.8 | 0.8 | 0.3 | 99.7 |
| #200 | 1.1 | 1.9 | 0.7 | 99.3 |
| PAN | 276.3 | 278.2 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.0
**Percent Sample Sand:** 0.7
**Percent Sample Silt/Clay:** 99.3
**Sample Weight:** 278.2g
**Washing Loss:** 276.3g

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# MECHANICAL GRAIN SIZE ANALYSES
## ASTM D 422 & D 1140

**Project:** Ark. NE College - New Allied Tech Center
**Location:** Blytheville, Arkansas
**Sample No.:** B14;P4
**Soil Description:** Silty clay
**Project No.:** 450015
**Date:** 01/25/16
**Sample Depth:** 7.5'-9.0'

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 0.0 | 0.0 | 0.0 | 100.0 |
| #10 | 0.5 | 0.5 | 0.1 | 99.9 |
| #40 | 3.1 | 3.6 | 0.7 | 99.3 |
| #200 | 1.8 | 5.4 | 1.1 | 98.9 |
| PAN | 488.8 | 494.2 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.0
**Percent Sample Sand:** 1.1
**Percent Sample Silt/Clay:** 98.9
**Sample Weight:** 494.2g
**Washing Loss:** 488.8g

**Project:** Ark. NE College - New Allied Tech Center
**Location:** Blytheville, Arkansas
**Sample No.:** B16;P5
**Soil Description:** Silty clay
**Project No.:** 450015
**Date:** 01/25/16
**Sample Depth:** 10.0'-11.5'

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 0.0 | 0.0 | 0.0 | 100.0 |
| #10 | 0.0 | 0.0 | 0.0 | 100.0 |
| #40 | 0.7 | 0.7 | 0.3 | 99.7 |
| #200 | 1.2 | 1.9 | 0.7 | 99.3 |
| PAN | 268.4 | 270.3 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.0
**Percent Sample Sand:** 0.7
**Percent Sample Silt/Clay:** 99.3
**Sample Weight:** 270.3g
**Washing Loss:** 268.4g

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# MECHANICAL GRAIN SIZE ANALYSES
# ASTM D 422 & D 1140

**Project:** Ark. NE College - New Allied Tech Center
**Location:** Blytheville, Arkansas
**Sample No.:** B9;P3
**Soil Description:** Silty clay
**Project No.:** 450015
**Date:** 01/25/16
**Sample Depth:** 5.0'-6.5'

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 0.0 | 0.0 | 0.0 | 100.0 |
| #10 | 0.0 | 0.0 | 0.0 | 100.0 |
| #40 | 5.4 | 5.4 | 1.2 | 98.8 |
| #200 | 9.7 | 15.1 | 3.4 | 96.6 |
| PAN | 429.2 | 444.3 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.0
**Percent Sample Sand:** 3.4
**Percent Sample Silt/Clay:** 96.6
**Sample Weight:** 444.3g
**Washing Loss:** 429.2g

**Project:** Ark. NE College - New Allied Tech Center
**Location:** Blytheville, Arkansas
**Sample No.:** B12;P6
**Soil Description:** Silty clay
**Project No.:** 450015
**Date:** 01/25/16
**Sample Depth:** 15.0'-16.5'

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 0.0 | 0.0 | 0.0 | 100.0 |
| #10 | 0.0 | 0.0 | 0.0 | 100.0 |
| #40 | 1.2 | 1.2 | 0.3 | 99.7 |
| #200 | 1.8 | 3.0 | 0.8 | 99.2 |
| PAN | 369.7 | 372.7 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.0
**Percent Sample Sand:** 0.8
**Percent Sample Silt/Clay:** 99.2
**Sample Weight:** 372.7g
**Washing Loss:** 369.7g

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# MECHANICAL GRAIN SIZE ANALYSES
# ASTM D 422 & D 1140

**Project:** Ark. NE College - New Allied Tech Center **Project No.:** 450015
**Location:** Blytheville, Arkansas **Date:** 01/25/16
**Sample No.:** P1;P2 **Sample Depth:** 2.5'-4.0'
**Soil Description:** Silty clay

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 0.0 | 0.0 | 0.0 | 100.0 |
| #10 | 0.8 | 0.8 | 0.2 | 99.8 |
| #40 | 4.5 | 5.3 | 1.2 | 98.8 |
| #200 | 5.4 | 10.7 | 2.4 | 97.6 |
| PAN | 440.7 | 451.4 | 100.0 | 0.0 |

**Percent Sample Gravel:** 0.0 **Sample Weight:** 451.4g
**Percent Sample Sand:** 2.4 **Washing Loss:** 440.7g
**Percent Sample Silt/Clay:** 97.6

**Project:** Ark. NE College - New Allied Tech Center **Project No.:** 450015
**Location:** Blytheville, Arkansas **Date:** 01/25/16
**Sample No.:** P8;P2 **Sample Depth:** 2.5'-4.0'
**Soil Description:** Silty clay

| Sieve or Screen | Weight Retained (grams) | Cumulative Weight Retained (grams) | Percent Retained | Percent Passing |
|---|---|---|---|---|
| 3" | 0.0 | 0.0 | 0.0 | 100.0 |
| 3/4" | 0.0 | 0.0 | 0.0 | 100.0 |
| #4 | 5.4 | 5.4 | 1.4 | 98.6 |
| #10 | 3.1 | 8.5 | 2.3 | 97.7 |
| #40 | 5.0 | 13.5 | 3.6 | 96.4 |
| #200 | 4.4 | 17.9 | 4.8 | 95.2 |
| PAN | 355.4 | 373.3 | 100.0 | 0.0 |

**Percent Sample Gravel:** 1.4 **Sample Weight:** 373.3g
**Percent Sample Sand:** 3.3 **Washing Loss:** 355.4g
**Percent Sample Silt/Clay:** 95.2

**ANDERSON ENGINEERING CONSULTANTS, INC.**
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# SHRINKAGE / SWELL INDEX TESTS

| | | | |
|---|---|---|---|
| **Project:** | Ark. NE College - New Allied Tech Center | **Project No.:** | 450015 |
| **Location:** | Blytheville, Arkansas | **Date:** | 01/21/16 |
| **Sample No.:** | B4;P2 | **Sample Depth:** | 2.5'-4.0' |
| **Soil Description:** | Silty clay | **K PRC:** | 2.0 |

| | | | |
|---|---|---|---|
| **Liquid Limit:** | 44 | **Est. Specific Gravity:** | 2.68 |
| **Plastic Limit:** | 18 | **No. of Layers:** | 4 |
| **Plasticity Index:** | 26 | **No. Blows/Layer:** | 7 |

## WATER CONTENT

| | Before Test | | After Test |
|---|---|---|---|
| Tare Number | 301 | Tare Number | 82 |
| Tare + Wet Soil | 114.9 g | Tare + Wet Soil | 161.7 g |
| Tare + Dry Soil | 94.6 g | Tare + Dry Soil | 135.3 g |
| Tare | 23.8 g | Tare | 50.4 g |
| Water Content | 28.6 % | Water Content | 31.2 % |
| Saturation | 94.3 % | Saturation | 100.0 % |
| Dry Density | 92.2 pcf | Dry Density | 92.0 pcf |

## VOID RATIO DETERMINATION

| | | | |
|---|---|---|---|
| Vo | 57.795 ccm | Vf | 57.795 ccm |
| Wt of Soil + Ring | 351.6 g | Wt of Soil + Ring | 353.6 g |
| Wt of Ring | 241.7 g | Wt of Ring | 241.7 g |
| Moist Wt of Soil | 109.9 g | Moist Wt fo Soil | 111.9 g |
| Vs | 31.892 ccm | Vs | 31.892 ccm |
| Eo | 0.8122 | Ef | 0.8122 |

## SWELL DATA

| Time | Dial ( * 0.0001) | Pressure | Void Ratio |
|---|---|---|---|
| 9.30 | 0.00 | 0.0 | 0.9065 |
| 11.30 | 1.00 | 138.6 | 0.9068 |
| 12.30 | 1.00 | 138.6 | 0.9068 |
| 17.00 | 1.00 | 138.6 | 0.9068 |
| 42.00 | 1.00 | 138.6 | 0.9068 |
| 47.00 | 1.00 | 138.6 | 0.9068 |
| 71.00 | 1.00 | 138.6 | 0.9068 |

Final Dial Reading: 1.00 Swell Pressure: **139 PSF**
Heave = 0.016 % = 0.0019 inches/foot

## SHRINKAGE DATA

Linear Shrinkage (Bar Method):
Linear Shrinkage: **11.3 %**
Volumetric Shrinkage: **30.2 %**

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# SHRINKAGE / SWELL INDEX TESTS

| | | | |
|---|---|---|---|
| **Project:** | Ark. NE College - New Allied Tech Cente | **Project No.:** | 450015 |
| **Location:** | Blytheville, Arkansas | **Date:** | 01/25/16 |
| **Sample No.:** | B6;P3 | **Sample Depth:** | 5.0'-6.5' |
| **Soil Description:** | Silty clay | **K PRC:** | 2.0 |

| | | | |
|---|---|---|---|
| **Liquid Limit:** | 30 | **Est. Specific Gravity:** | 2.68 |
| **Plastic Limit:** | 22 | **No. of Layers:** | 4 |
| **Plasticity Index:** | 8 | **No. Blows/Layer:** | 7 |

## WATER CONTENT

| | Before Test | | After Test |
|---|---|---|---|
| Tare Number | 42 | Tare Number | 11 |
| Tare + Wet Soil | 152.4 g | Tare + Wet Soil | 170.6 g |
| Tare + Dry Soil | 129.4 g | Tare + Dry Soil | 145.5 g |
| Tare | 31.3 g | Tare | 50.4 g |
| Water Content | 23.4 % | Water Content | 26.5 % |
| Saturation | 100.0 % | Saturation | 100.0 % |
| Dry Density | 103.6 pcf | Dry Density | 102.9 pcf |

## VOID RATIO DETERMINATION

| | | | |
|---|---|---|---|
| Vo | 57.786 ccm | Vf | 57.786 ccm |
| Wt of Soil + Ring | 360.1 g | Wt of Soil + Ring | 362.3 g |
| Wt of Ring | 241.7 g | Wt of Ring | 241.7 g |
| Moist Wt of Soil | 118.4 g | Moist Wt fo Soil | 120.6 g |
| Vs | 35.807 ccm | Vs | 35.807 ccm |
| Eo | 0.6138 | Ef | 0.6138 |

## SWELL DATA

| Time | Dial ( * 0.0001) | Pressure | Void Ratio |
|---|---|---|---|
| 13.00 | 0.00 | 0.0 | 0.6980 |
| 15.00 | 0.00 | 0.0 | 0.6980 |
| 17.00 | 0.00 | 0.0 | 0.6980 |
| 32.00 | 0.00 | 0.0 | 0.6980 |
| 34.00 | 0.00 | 0.0 | 0.6980 |
| 35.00 | 0.00 | 0.0 | 0.6980 |
| 36.00 | 0.00 | 0.0 | 0.6980 |

Final Dial Reading: 0.00 Swell Pressure: **0 PSF**

Heave = 0.000 % = 0.0000 inches/foot

## SHRINKAGE DATA

Linear Shrinkage (Bar Method):

Linear Shrinkage: **3.8 %**

Volumetric Shrinkage: **11.0 %**

ANDERSON ENGINEERING CONSULTANTS, INC.
3217 NEIL CIRCLE, JONESBORO, ARKANSAS 72401

# SHRINKAGE / SWELL INDEX TESTS

| | | | |
|---|---|---|---|
| **Project:** | Ark. NE College - New Allied Tech Center | **Project No.:** | 450015 |
| **Location:** | Blytheville, Arkansas | **Date:** | 01/19/16 |
| **Sample No.:** | B17;P2 | **Sample Depth:** | 2.5'-4.0' |
| **Soil Description:** | Fat clay | **K PRC:** | 2.0 |

| | | | |
|---|---|---|---|
| **Liquid Limit:** | 53 | **Est. Specific Gravity:** | 2.70 |
| **Plastic Limit:** | 24 | **No. of Layers:** | 4 |
| **Plasticity Index:** | 29 | **No. Blows/Layer:** | 7 |

## WATER CONTENT

| | Before Test | | After Test |
|---|---|---|---|
| Tare Number | 13 | Tare Number | 5 |
| Tare + Wet Soil | 88.4 g | Tare + Wet Soil | 168.0 g |
| Tare + Dry Soil | 71.1 g | Tare + Dry Soil | 139.4 g |
| Tare | 14.2 g | Tare | 49.6 g |
| Water Content | 30.5 % | Water Content | 31.9 % |
| Saturation | -191.1 % | Saturation | -199.6 % |
| Dry Density | 296.0 pcf | Dry Density | 295.1 pcf |

## VOID RATIO DETERMINATION

| | | | |
|---|---|---|---|
| Vo | 57.815 ccm | Vf | 57.815 ccm |
| Wt of Soil + Ring | 358.1 g | Wt of Soil + Ring | 360.8 g |
| Wt of Ring | g | Wt of Ring | 0.0 g |
| Moist Wt of Soil | 358.1 g | Moist Wt fo Soil | 360.8 g |
| Vs | 101.611 ccm | Vs | 101.611 ccm |
| Eo | -0.4310 | Ef | -0.4310 |

## SWELL DATA

| Time | Dial ( * 0.0001) | Pressure | Void Ratio |
|---|---|---|---|
| 14.00 | 0.00 | 0.0 | -0.4016 |
| 16.00 | 1.00 | 138.6 | -0.4015 |
| 32.45 | 2.50 | 346.5 | -0.4014 |
| 49.45 | 3.00 | 415.8 | -0.4013 |
| 53.45 | 3.00 | 415.8 | -0.4013 |
| 97.45 | 3.00 | 415.8 | -0.4013 |

Final Dial Reading: 3.00 Swell Pressure: **416 PSF**
Heave = 0.048 % = 0.0058 inches/foot

## SHRINKAGE DATA

Linear Shrinkage (Bar Method):
Linear Shrinkage: **13.8 %**
Volumetric Shrinkage: **35.9 %**

# SECTION 02200
# SITE PREPARATION

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Selective demolition of built site elements, asphalt paving and concrete paving.

B. Clearing and protection of vegetation.

C. Removal of existing debris.

D. Abandonment and removal of existing utilities and utility structures.

### 1.02 SUBMITTALS:

A. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

### 1.03 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. Comply with other requirements specified in Section 01700.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Fill Material: As specified in Section 02310 - Grading.

## PART 3 - EXECUTION

### 3.01 EXISTING UTILITIES:

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. 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 Owner and Local Utility Companies.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

**3.02 VEGETATION:**

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the limits indicated on drawings.

C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. At vegetation removal limits.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. 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.
   2. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
   3. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

F. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

**3.03 EXISTING BUILT ELEMENTS:**

A. Scope:
   1. Remove paving and curbs as required to accomplish new work.
   2. Saw cut and remove damaged asphalt as shown on the Demolition and Erosion Control Plan.
   3. Remove all other paving and curbs within site boundaries.
   4. Remove concrete slabs on grade within site boundaries.
   5. Remove and/or adjust to proposed finish grade manholes and manhole covers, curb inlets and catch basins as shown on plans.
   6. Remove other items indicated, for salvage, relocation, and recycling.
   7. 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.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Use of explosives is not permitted.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permit.

8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

E. If hazardous materials are discovered during removal operations, stop work and notify AC Williams and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

**3.04 DEBRIS:**

A. Remove debris, junk, and trash from site.

**3.05 WASTE REMOVAL:**

A. Remove from site all materials not to be reused on site; do not burn or bury.

B. Leave site in clean condition, ready for subsequent work.

**END OF SECTION**

# SECTION 02230
# SITE CLEARING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Clearing and protection of vegetation.

B. Removal of existing debris.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Fill Material: As specified in Section 02310 - Grading

## PART 3 - EXECUTION

### 3.01 SITE CLEARING:

A. Comply with other requirements specified in Section 01700.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

### 3.02 EXISTING UTILITIES AND BUILT ELEMENTS:

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

### 3.03 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 02310
# GRADING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Removal and storage of topsoil.

B. Rough grading and excavating the site for site structures, building pads, and paving.

C. Finish grading .

### 1.02 RELATED REQUIREMENTS:

A. Section 02315 - Excavation.

B. Section 02316 - Fill: Filling and compaction.

### 1.03 PROJECT CONDITIONS:

A. Protect above- and below-grade utilities that remain.

B. Protect plants, lawns, and other features to remain as a portion of final landscaping.

C. 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: Topsoil excavated on-site.
   1. Graded.
   2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.

B. Other Fill Materials: See Section 02316.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

### 3.02 PREPARATION:

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

## 3.03 ROUGH GRADING:

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 02316 for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

## 3.04 SOIL REMOVAL AND STOCKPILING:

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

D. Any removed or displaced strippings, topsoil, or excavation material that is to be removed from the site as a result of work required by this specification section is to be stockpiled on campus at a location to be determined by the owner.

E. Spreading or dressing of stockpiled material deposited at above location will be by the owner.

## 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 the following compacted thicknesses:
   1. Areas to be Seeded with Grass: 6 inches deep to finish grade.
   2. Areas to be Sodded: 4 inches deep to 2 inches below finish grade
   3. Shrub Beds: 18 inches deep to finish grade.
   4. Flower Beds: 12 inches deep to finish grade.
   5. Planter Boxes: To within 3 inches of box rim.

H. place topsoil during dry weather.

I. Remove roots, weeds, rocks, and foreign material while spreading.

J. Near plants spread topsoil manually to prevent damage.

K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

L. 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 REPAIR AND RESTORATION:**

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from AC Williams as to remedy.

**3.08 CLEANING:**

A. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION**

# SECTION 02315
# EXCAVATION

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Excavating for footings, slabs-on-grade, paving, and site structures.

### 1.02 RELATED REQUIREMENTS:

A. Section 02310 - Grading: Soil removal from surface of site.

B. Section 02310 - Grading: Grading.

C. Section 02316 - 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 EXAMINATION:

A. Verify that survey bench mark and intended elevations for the work are as indicated.

### 3.02 PREPARATION:

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Notify utility company to remove and relocate utilities.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect plants, lawns, rock outcroppings, and other features to remain.

### 3.03 EXCAVATING:

A. Excavate to accommodate construction operations.

B. Notify AC Williams 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 angle of repose or less until shored.

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 02316 - Fill.

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.

J. Stockpile excavated material to be re-used in area designated on site in accordance with Section 02310 - Grading.

K. Remove excess excavated material from site.

L. Any removed or displaced strippings, topsoil, or excavation material that is to be removed from the site as a result of work required by this specification section is to be stockpiled on campus at a location to be determined by the owner.

M. Spreading or dressing of stockpiled material deposited at above location will be by the owner.

**3.04 FIELD QUALITY CONTROL:**

A. See Section 01400 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

**3.05 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 02316
# FILL AND BACKFILL

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, and site structures.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

### 1.02 RELATED REQUIREMENTS:

A. Section 02310 - Grading: Removal and handling of soil to be re-used.

B. Section 02310 - Grading: Site grading.

C. Section 02315- Excavation: Removal and handling of soil to be re-used.

### 1.03 REFERENCE STANDARDS:

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2015.

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

D. 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.

E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

F. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

### 1.04 SUBMITTALS:

A. See Section 01300 - 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.

### 1.05 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.

## PART 2 - PRODUCTS

### 2.01 FILL MATERIALS:

A. General Fill: Subsoil excavated on-site or 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, GP, GM and SM.
   4. May be soil removed from excavations.
   5. Alternate material if approved in writing by geotechnical engineer.

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 D2487 Group Symbol CL.
      a. Liquid limit no greater than 45; ASTM D 4318.
      b. Plasticity index less than 25; ASTM D 4318.

C. Concrete for Fill: Flowable Fill; compressive strength not to exceed 1000 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. Topsoil: See Section 02310 - Grading

### 2.02 SOURCE QUALITY CONTROL:

A. See Section 01400 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 02310 - Grading for additional requirements.

**3.02 PREPARATION:**

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

**3.03 FILLING:**

A. Fill 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. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.
1. Load-bearing foundation surfaces: Fill with concrete concrete or flowable fill (minimum compressive strenght 300 psi).
2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.

I. Compaction Density Unless Otherwise Specified or Indicated:
1. Under paving, slabs-on-grade, and similar construction: 98 percent of maximum dry density based on a modified proctor.
2. At other locations: 95 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.

**3.04 FILL AT SPECIFIC LOCATIONS:**

A. Use general fill unless otherwise specified or indicated.

B. Structural Fill:
1. Fill up to subgrade elevations.
2. Maximum depth per lift: 6 inches, compacted.
3. Compact to minimum 98 percent of maximum dry density based on a modified proctor.

C. Under Interior Slabs-On-Grade:
1. Use granular fill.
2. Depth: 4 inches deep minimum.

3. Compact to 95 percent of maximum dry density.

D. At Foundation Walls and Footings:
1. Use general fill.
2. Fill up to subgrade elevation.
3. Compact each lift to 95 percent of maximum dry density.
4. Do not backfill against unsupported foundation walls.
5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

E. At Lawn Areas:
1. Use general fill.
2. Fill up to 6 inches below finish grade elevations.
3. Compact to 90 percent of maximum dry density.
4. See Section 31 22 00 for topsoil placement.

F. At Planting Areas Other Than Lawns :
1. Use general fill.
2. Fill up to 12 inches below finish grade elevations.
3. Compact to 90 percent of maximum dry density.
4. See Section 02310 - Grading for topsoil placement.

## 3.05 TOLERANCES:

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2" inch from required elevations.

## 3.06 FIELD QUALITY CONTROL:

A. See Section 01400 - 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. Test 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 genral 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, paving, and curbs/sidewalks.

## 3.07 CLEANING:

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

**END OF SECTION**

# SECTION 02317
# TRENCHING FOR SITE UTILITIES

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Backfilling and compacting for utilities outside the building to the existing or proposed utility main lines.

### 1.02 RELATED REQUIREMENTS:

A. Section 02310 - Grading: Site grading.

### 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; 2015.

B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012.

D. 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.

E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

F. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

### 1.04 SUBMITTALS:

A. See Section 01300 - 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.

### 1.05 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.

**PART 2 - PRODUCTS**

**2.01 FILL MATERIALS:**

A. General Fill: Subsoil excavated on-site or imported borrow.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   3. Conforming to ASTM D2487 Group Symbol CL.

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 - Fill Type Pipe Bedding - AHTD Class 8 Crushed Limestone (3/4" minus): conforming to State of Arkansas Highway Department standard.

E. Topsoil: See Section 02316 - Fill.

**2.02 SOURCE QUALITY CONTROL:**

A. See Section 01400 - 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. Verify that survey bench marks and intended elevations for the work are as indicated.

**3.02 PREPARATION:**

A. Identify required lines, levels, contours, and datum locations.

B. See Section 02310 - Grading for additional requirements.

**3.03 TRENCHING:**

A. Notify AC Williams 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.

G. Remove excess excavated material from site.

H. Any removed or displaced strippings, topsoil, or excavation material that is to be removed from the site as a result of work required by this specification section is to be stockpiled on campus at a location to be determined by the owner.

I. Spreading or dressing of stockpiled material deposited at above location will be by the owner.

**3.04 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.

**3.05 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 95 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:
1. Under paving, slabs-on-grade, and similar construction: Flowable Fill (1000 psi max) to sub-grade or existing asphalt surface.
2. At other locations: 95 percent of maximum dry density standard proctor.

H. Reshape and re-compact fills subjected to vehicular traffic.

**3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS:**

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, and Duct Bank:
1. Bedding: Use granular fill (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 standard proctor.

C. At Pipe Culverts and Storm Drainage Piping:
1. Bedding: Use granular fill.
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 standard proctor.

D. At paved parking lots, driveways, concrete walks and other site paving:
   1. Bedding: Use granular fill (3/4" minus crushed limestone).
   2. Cover to approximately 12 inches above pipe or conduit with granular fill.
   3. Use Flowable Fill Concrete for fill up to subgrade.

**3.07 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.

**3.08 FIELD QUALITY CONTROL:**

A. See Section 01400 - 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.

**3.09 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 02361
# SOIL TREATMENT FOR TERMITE CONTROL

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Chemical soil treatment.

### 1.2 REFERENCES:

A. Title 7, United States Code, 136 through 136y - Federal Insecticide, Fungicide and Rodenticide Act; United States Code; 1947 (Revised 1988).

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Indicate toxicants to be used, composition by percentage, dilution schedule, intended application rate.

C. Test Reports: Indicate regulatory agency approval reports when required.

D. Manufacturer's Certificate: Certify that toxicants meet or exceed specified requirements.

### 1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Company specializing in performing this type work and:
   1. Having minimum of 5 years documented experience.
   2. Approved by manufacturer of treatment materials.
   3. Licensed in the State in which the Project is located.

### 1.5 REGULATORY REQUIREMENTS:

A. Conform to applicable code for requirements for application, and comply with EPA regulations.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of toxicants.

### 1.6 SEQUENCING:

A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

### 1.7 WARRANTY:

A. See Section 01780 - 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.

## PART 2 - PRODUCTS

## 2.1 MATERIALS:

A. Toxicant Chemical: EPA approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

## 2.2 MIXES:

A. Mix toxicant to manufacturer's instructions.

# PART 3 - EXECUTION

## 3.1 EXAMINATION:

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

## 3.2 APPLICATION:

A. Spray apply toxicant in accordance with manufacturer's instructions.

B. Apply toxicant at following locations:
1. Under Slabs-on-Grade.
2. At Both Sides of Foundation Surface.

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.

## 3.3 PROTECTION OF FINISHED WORK:

A. Do not permit soil grading over treated work.

**END OF SECTION**

# SECTION 02535
# SITE SANITARY UTILITY SEWERAGE PIPING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Sanitary sewerage drainage piping, fittings, and accessories.

B. Connection of building sanitary drainage system to municipal sewers.

C. Cleanout access.

### 1.02 REFERENCE STANDARDS:

A. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2016.

B. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2009 (Reapproved 2014).

C. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

D. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.

E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

F. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.

G. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

H. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

I. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

### 1.03 SUBMITTALS:

A. See Section 01330 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories .

C. Project Record Documents:
   1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

### 1.04 REGULATORY REQUIREMENTS:

A. Conform to applicable code for materials and installation of the Work of this section.

## PART 2 - PRODUCTS

**2.01 SEWER PIPE MATERIALS:**

A. Plastic Pipe: ASTM D1785, Schedule 40, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 4 inches, bell and spigot style solvent sealed joint end.

B. Joint Seals: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

**2.02 BEDDING AND COVER MATERIALS:**

A. Pipe Bedding Material: As specified in Section 02317 - Trenching.

B. Pipe Cover Material: As specified in Section 02317 - Trenching.

**PART 3 - EXECUTION**

**3.01 TRENCHING:**

A. See Section 02317 - Trenching for additional requirements.

B. Hand trim excavation for accurate placement of pipe to elevations indicated.

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, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building sanitary sewer outlet .

**3.03 FIELD QUALITY CONTROL:**

A. Perform field inspection and testing in accordance with Section 01400 - Quality Requirements.

B. Pressure Test: Test in accordance with local utility Standard Specifications.

C. Infiltration Test: Test in accordance with local utility Standard Specifications.

D. Deflection Test: Test in accordance with local utility Standard Specifications.

**3.04 PROTECTION:**

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**

# SECTION 02635
# SITE STORM UTILITY DRAINAGE PIPING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Storm drainage piping, fittings, and accessories.

B. Connection of drainage system to municipal sewers.

C. Catch basins, Paved area drainage, and Site surface drainage.

### 1.02 REFERENCE STANDARDS:

A. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.

B. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

C. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

D. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

E. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

### 1.03 SUBMITTALS:

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating pipe, pipe accessories .

### 1.04 REGULATORY REQUIREMENTS:

A. Conform to applicable code for materials and installation of the Work of this section.

## PART 2 - PRODUCTS

### 2.01 SEWER PIPE MATERIALS:

A. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class II with Wall type A; mesh reinforcement; inside nominal diameter of (see Plans inches, bell and spigot end joints.

B. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

C. Plastic Pipe: ASTM D 3034, Type PSM, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 12 inches, bell and spigot style rubber gasket joint end.

### 2.02 PIPE ACCESSORIES:

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required

tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

**2.03 CATCH BASIN, TRENCH DRAIN, CLEANOUT, AND AREA DRAIN COMPONENTS:**

A. Lids and Drain Covers: Cast iron, cast iron frame.
   1. Catch Basin:
      a. Lid Design: See Sheets C003 & C006.
   2. Cleanout:
      a. Lid Design: See Sheets C003 & C006.
   3. Area Drain:
      a. Lid Design: See Sheets C003 & C006.

**2.04 BEDDING AND COVER MATERIALS:**

A. Bedding: As specified in Section 02317 - Trenchnig.

B. Cover: As specified in Section 02317 - Trenching.

**PART 3 - EXECUTION**

**3.01 TRENCHING:**

A. See Section 02315 - Excavation and Section 02316 - Fill for additional requirements.

B. See Section 02317 - Trenching 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, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
   1. Plastic Pipe: Also comply with ASTM D2321.

C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system as required.

**3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS:**

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

**3.04 FIELD QUALITY CONTROL:**

A. Perform field inspection in accordance with Section 01400 - Quality Requirements.

**3.05 PROTECTION:**

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**

# SECTION 02636
# SITE WATER UTILITY DISTRIBUTION PIPING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Pipe and fittings for site water lines including domestic water lines and fire water lines.

B. Valves, Fire hydrants, and Domestic water hydrants.

### 1.02 REFERENCES:

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.

C. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2014.

D. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.

E. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2015.

F. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2013.

G. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).

H. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2015.

I. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).

J. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

K. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water; 2013.

L. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.

M. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

N. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2009.

O. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service; 2009.

P. AWWA C502 - Dry-Barrel Fire Hydrants; 2014.

Q. AWWA C508 - Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS; 2011.

R. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service; 2009.

S. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances; American Water Works Association; 2005 (ANSI/AWWA C600).

T. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2007, with 2008 Errata.

**1.03 SUBMITTALS:**

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

**1.04 QUALITY ASSURANCE:**

A. Perform Work in accordance with utility company requirements.

**1.05 DELIVERY, STORAGE, AND HANDLING:**

A. Deliver and store valves in shipping containers with labeling in place.

**PART 2 - PRODUCTS**

**2.01 WATER PIPE:**

A. Ductile Iron Pipe: AWWA C151:
1. Fittings: Ductile iron, standard thickness.
2. Joints: AWWA C111, rubber gasket with rods.
3. Jackets: AWWA C105/A21.5 polyethylene jacket.

B. Copper Tubing: ASTM B88, Type K, annealed:
1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
2. Joints: Compression connection or AWS A5.8M/A5.8, BCuP silver braze.

C. PVC Pipe: ASTM D 1785, Schedule 40.
1. Fittings: ASTM D2466, PVC.
2. Joints: ASTM D2855, solvent weld.

D. PVC Pipe: AWWA C900 Class 150:
1. Fittings: AWWA C111, cast iron.
2. Joints: ASTM D3139 compression gasket ring.

E. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service " in large letters.

**2.02 VALVES:**

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Gate Valves Up To 3 Inches:
1. Brass or Bronze body, non-rising stem, inside screw, single wedge or disc, compression

ends, with control rod, post indicator, valve key, and extension box.

C. Gate Valves 3 Inches and Over:
1. AWWA C500, iron body, bronze trim, non-rising stem with square nut, single wedge, flanged ends, control rod, post indicator, valve key, and extension box.

D. Ball Valves Up To 2 Inches:
1. Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.

E. Swing Check Valves From 2 Inches to 24 Inches:
1. AWWA C508, iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

**2.03 HYDRANTS:**

A. Hydrants: Type as required by utility company.

B. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.

C. Hose and Streamer Connection: Match sizes with utility company, two hose nozzles, one pumper nozzle.

D. Finish: Primer and two coats of enamel in color required by utility company.

**2.04 BEDDING AND COVER MATERIALS:**

A. Bedding: As specified in Section 02317 - Trenching.

B. Cover: As specified in Section 02317 - Trenching.

**2.05 ACCESSORIES:**

A. Concrete for Thrust Restraints: Concrete type specified in Section 03300 - Cast In Place Concrete.

B. Backflow Preventer: see plumbing plans.

C. Meter: see plumbing plans.

**PART 3 - EXECUTION**

**3.01 EXAMINATION:**

A. Verify that building service connection and municipal utility water main size, location, and invert are as indicated.

**3.02 PREPARATION:**

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.03 TRENCHING:

A. See the sections on excavation and fill for additional requirements.

B. See Section 02317 - Trenching for additional requirements.

C. Hand trim excavation for accurate placement of pipe to elevations indicated.

D. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide 12 sq ft thrust restraint bearing on subsoil.

E. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

**3.04 INSTALLATION - PIPE:**

A. Maintain separation of water main from sewer piping in accordance with Arkansas Department of Health code.

B. Group piping with other site piping work whenever practical.

C. Establish elevations of buried piping to ensure not less than 3 ft of cover.

D. Install pipe to indicated elevation to within tolerance of 5/8 inches.

E. Install ductile iron piping and fittings to AWWA C600.

F. Route pipe in straight line.

G. Install pipe to allow for expansion and contraction without stressing pipe or joints.

H. Install access fittings to permit disinfection of water system performed under Section 33 13 00.

I. Install trace wire 6 inches above top of pipe; coordinate with Section 02317 - Trenching

**3.05 INSTALLATION - VALVES AND HYDRANTS:**

A. Set valves on solid bearing.

B. Center and plumb valve box over valve. Set box cover flush with finished grade.

C. Set hydrants plumb; locate pumper nozzle perpendicular to and facing roadway.

D. Set hydrants to grade, with nozzles at least 20 inches above ground.

E. Locate control valve 4 inches away from hydrant.

F. Provide a drainage pit 36 inches square by 24 inches deep filled with 2 inches washed gravel. Encase elbow of hydrant in gravel to 6 inches above drain opening. Do not connect drain opening to sewer.

G. Paint hydrants in accordance with Section 09900 - Paint and Coatings.

**3.06 SERVICE CONNECTIONS:**

A. Provide water service to utility company requirements with reduced pressure backflow preventer and water meter with bypass valves and sand strainer.

**3.07 FIELD QUALITY CONTROL:**

A. Perform field inspection and testing in accordance with Section 01400 - Quality Requirements.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

**END OF SECTION**

# SECTION 02640
# MANHOLES AND COVERS

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage, and accessories.

B. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.

### 1.02 REFERENCE STANDARDS:

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2012).

B. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015.

C. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008 (Reapproved 2013).

### 1.03 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

B. Curb Inlet and Junction Box Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with resilient connectors complying with ASTM C 923 (ASTM C 923M).

C. Concrete: As specified in Section 03300 - Cast In Place Concrete.

D. Concrete Reinforcement: As specified in Section 03300 - Cast In Place Concrete.

### 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; .

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is correct.

**3.02 PREPARATION:**

A. Coordinate placement of inlet and outlet pipe required by other sections.

**3.03 MANHOLES:**

A. Place concrete base pad, trowel top surface level.

B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.

C. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As work progresses, build in fabricated metal items.

D. 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 02641
# PIPE CULVERTS

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Pipe culvert, joints and accessories.

B. Bedding and slope protection at pipe end.

### 1.02 RELATED REQUIREMENTS:

A. Section 02315 - Excavation: Excavating of trenches.

B. Section 02317 - Trenching: Excavating, bedding, and backfilling.

C. Section 02316 - Fill: Bedding and backfilling.

D. See Civil Drawings - Riprap.

### 1.03 PRICE AND PAYMENT PROCEDURES:

A. Pipe Culvert: By the total linear foot invert length of pipe including tapered ends and the diameter in inches. Includes hand trimming, excavating; removing soft subsoil, bedding fill, compacting; pipe, fittings and accessories assembled; repair of damaged coating.

### 1.04 REFERENCE STANDARDS:

A. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.

B. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2014.

C. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.

D. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011.

### 1.05 SUBMITTALS:

A. See Section 01300 - Administrative Requirements, for submittal procedures.

## PART 2 - PRODUCTS

### 2.01 CONCRETE CULVERT PIPE:

A. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class I with Wall Type A; mesh reinforcement; bell and spigot end joints:
   1. Shape: Circular, refer to civil drawings and/or verify nominal diameter with Civil Engineer.

B. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.

## PART 3 - EXECUTION

**3.01 EXCAVATING:**

A. See Section 02315 - Excavation and Section 02316 - Fill for additional requirements.

B. Excavate culvert trench to 6 inches below pipe invert. Hand trim excavation for accurate placement of pipe to elevations indicated.

**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.

E. Repair surface damage to pipe protective coating with two coats of compatible bituminous paint coating.

**3.03 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.

**END OF SECTION**

# SECTION 02721
# AGGREGATE BASE COURSE

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Aggregate base course.

### 1.02 REFERENCE STANDARDS:

A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 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; 2015.

C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.

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 D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

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 Department, Edition of 2003.

### 1.03 SUBMITTALS:

A. See Section 01300 - Administrative Requirements, 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.

### 1.04 DELIVERY, STORAGE, AND HANDLING:

A. When necessary, store materials on site in advance of need.

B. Aggregate Storage, General:
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 AHTD Class 7: Angular crushed 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 inche 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 01400 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. 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:

A. Under Bituminous Concrete Paving:
1. Place coarse aggregate to a total compacted thickness of (see Civil Details) inches
2. Compact to 98 percent of maximum dry density based upon the modified proctor curve.

B. Under Portland Cement Concrete Paving:
1. Place coarse aggregate to a total compacted thickness of (see Civil Details) inches.
2. Compact to 98 percent of maximum dry density based upon the modified proctor curve.

C. Place aggregate in maximum 7 inch layers and roller compact to specified density.

D. Level and contour surfaces to elevations and gradients indicated.

E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

G. 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 01400 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: 1 per 5,000 sq. ft. of surface.

F. Proof roll compacted aggregate at surfaces that will be under paving.

**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 02741
# ASPHALT PAVING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Double course bituminous concrete paving.

### 1.02 REFERENCE STANDARDS:

A. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

B. Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 1993 (included with this specification).

### 1.03 PERFORMANCE REQUIREMENTS:

A. Design paving and subbase at streets and drives for light duty commercial vehicle traffic.

### 1.04 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.

### 1.05 REGULATORY REQUIREMENTS:

A. Conform to Arkansas Highway and Transportation Department code for paving work on State Owned property.

### 1.06 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 Surface Course : Angular crushed washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C136, 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

C. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

D. Primer: In accordance with State of Arkansas Highways standards.

E. 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 III 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

**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. See Section 02721 - Aggregate Base Course.

**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 - DOUBLE COURSE:**

A. Use asphalt surface course mix for binder course.

B. Place asphalt binder course within 24 hours of applying primer or tack coat.

C. Apply tack coat to binder course prior to placing wearing asphalt surface course.

D. Place surface course within two hours of placing and compacting binder course.

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.

**3.07 TOLERANCES:**

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Variation from True Elevation: Within 1/2 inch.

**3.08 FIELD QUALITY CONTROL:**

A. See Section 01400 - 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.

**3.09 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 02751
# CONCRETE PAVING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Concrete sidewalks, integral curbs, gutters, median barriers, parking areas, and roads.

### 1.02 REFERENCE STANDARDS:

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

B. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

C. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 1999.

D. ACI 306R - Cold Weather Concreting; 2010.

E. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete; 2007.

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

K. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.

L. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

M. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

N. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

P. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

Q. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2004a (Reapproved 2013).

R. Standard Specifications for Highway Construction, Arkansas State Highway and Transportation Department, Edition of 2003.

**1.03 PERFORMANCE REQUIREMENTS:**

A. Design paving for movement of trucks up to 60,000 lbs, and walks.

**1.04 SUBMITTALS:**

A. See Section 01300 - Administrative Requirements, 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. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

**2.02 REINFORCEMENT:**

A. Reinforcing Steel: ASTM A615/A615M, Grade 80 (80,000 psi) yield strength; deformed billet steel bars; unfinished.

B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.

C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish.

**2.03 CONCRETE MATERIALS:**

A. Obtain cementitious materials from same source throughout.

B. Concrete Materials: As specified in Section 03300 - Cast In Place Concrete.

C. Cement: ASTM C150/C150M Normal - Type I portland type, grey color.

D. Fine and Coarse Mix Aggregates: ASTM C33/C33M.

E. Fly Ash: ASTM C618, Class C or F.

F. Water: Clean, and not detrimental to concrete.

G. Air-Entraining Admixtures: ASTM C260/C260M.

**2.04 ACCESSORIES:**

A. Curing Compound: ASTM C309, Type 1, Class A.
1. Acceptable Products:

**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 AC Williams for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Concrete Properties:
1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4000 psi as indicated on drawings.
2. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.

**PART 3 - EXECUTION**

**3.01 EXAMINATION:**

A. Verify compacted subgrade is acceptable 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 SUBBASE:**

A. See Section 02721 - Aggregate Base Course 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 frames with oil to prevent bond with concrete pavement.

C. Notify AC Williams 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 as indicated.

B. Interrupt reinforcement at contraction joints.

C. Place dowels to achieve pavement and curb alignment as detailed.

**3.06 COLD AND HOT WEATHER CONCRETING:**

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

**3.07 PLACING CONCRETE:**

A. Place concrete in accordance with ACI 304R.

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. Do not break or interrupt successive pours such that cold joints occur.

**3.08 JOINTS:**

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 60 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 joints.
   1. At 6 feet intervals or as shown on plan drawings. Not to exceed 15 feet.
   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 preferably within the first 12 hours but not to exceed 24 hours. Depth of saw cut to be equal to 1/4 of the slab thickness.

**3.09 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. Place curing compound on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

**3.10 JOINT SEALING:**

A. See Section 07900 for joint sealer requirements.

**3.11 TOLERANCES:**

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

**3.12 FIELD QUALITY CONTROL:**

A. An independent testing agency will perform field quality control tests, as specified in Section 01400 - Quality Requirements.
   1. Provide free access to concrete operations at project site and cooperate with appointed firm.
   2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
   3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 75 cu yd or less of each class of concrete placed.
   1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
   2. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

**3.13 PROTECTION:**

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

**END OF SECTION**

# SECTION 02870
# PARKING BUMPERS

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Precast concrete parking bumpers and anchorage.

### 1.02 SUBMITTALS:

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Parking Bumpers: Precast concrete, conforming to the following:
   1. Profile: Manufacturer's standard.
   2. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
   3. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
   4. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
   5. Air Entrainment Admixture: ASTM C260/C260M.
   6. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
   7. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
   8. Embed reinforcing steel, and drill or sleeve for two dowels.
   9. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   10. Minor patching in plant is acceptable, providing appearance of units is not impaired.

## PART 3 - EXECUTION

### 3.01 INSTALLATION:

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels per unit.

**END OF SECTION**

# SECTION 02872
# PAINTED PAVEMENT MARKINGS

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Parking lot markings, including parking bays, crosswalks, and curb markings.

B. Roadway lane markings and crosswalk markings.

### 1.02 REFERENCE STANDARDS:

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.

B. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.

### 1.03 DELIVERY, STORAGE, AND HANDLING:

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

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

C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

### 1.04 FIELD CONDITIONS:

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
   1. Parking Lots: Yellow.
   2. Handicapped Symbols: Blue.

B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

## 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 AC Williams of unsatisfactory preparation before proceeding.

3.02 PREPARATION:

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

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

C. Clean surfaces thoroughly prior to installation.
1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

F. Temporary Pavement Markings: When required or directed by AC Williams, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
2. At Contractor's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

**3.03 INSTALLATION:**

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings true, sharp edges and ends.
1. Apply paint in one coat only.
2. Wet Film Thickness: 0.015 inch, minimum.
3. Length Tolerance: Plus or minus 3 (.
4. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.

1. Conduct operations in such a manner that necessary traffic can move without hindrance.
2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.

H. 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.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

**3.04 DRYING, PROTECTION, AND REPLACEMENT:**

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner.

**END OF SECTION**

# SECTION 02921
# SEEDING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Preparation of subsoil.

B. Placing topsoil.

C. Seeding, mulching and fertilizer.

### 1.02 DEFINITIONS:

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

### 1.03 REGULATORY REQUIREMENTS:

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

### 1.04 DELIVERY, STORAGE, AND HANDLING:

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Furnish maintenance of seeded areas for three months from Date of Substantial Completion.

C. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

## PART 2 - PRODUCTS

### 2.01 SEED MIXTURE:

A. Seed Mixture:
   1. Norlea Perennial Rye: 50 percent.
   2. Bermuda Grass (common) hulled: 50 percent.

### 2.02 SOIL MATERIALS:

A. Topsoil: Excavated from site and free of weeds.

### 2.03 ACCESSORIES:

A. Fertilizer: 10-20-10; recommended for grass, with fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, to the following proportions:

B. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

## 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 02310.

B. Place topsoil in accordance with Section 02310.

**3.03 FERTILIZING:**

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.

D. Mix thoroughly into upper 2 inches of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

**3.04 SEEDING:**

A. Apply seed at a rate of 1.0 lbs per 1000 sq ft evenly in two intersecting directions. Rake in lightly.

B. Do not sow immediately following rain, when ground is too dry, or during windy periods.

C. Roll seeded area with roller not exceeding 112 lbs.

D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches. Maintain clear of shrubs and trees.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

**END OF SECTION**

# SECTION 02923
# SODDING

## PART 1 - GENERAL

### 1.01 SECTION INCLUDES:

A. Preparation of subsoil.

B. Placing topsoil.

C. Fertilizing.

D. Sod installation.

### 1.02 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, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

### 1.03 REFERENCE STANDARDS:

A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; 2006.

### 1.04 SUBMITTALS:

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Certification: Submit certification of grass species and location of sod source.

### 1.05 QUALITY ASSURANCE:

A. Sod Producer: Company specializing in sod production and harvesting with minimum five years experience, and certified by the State of Arkansas.

### 1.06 REGULATORY REQUIREMENTS:

A. Comply with regulatory agencies for fertilizer and herbicide composition.

### 1.07 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.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

A. Sod: TPI, Certified Turfgrass Sod quality; cultivated grass sod; type indicated below; 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.

## PART 3 - EXECUTION

### 3.01 EXAMINATION:

A. Verify that prepared soil base is ready to receive the work of this section.

### 3.02 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.

### 3.03 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 smooth and tight with no open joints visible, and no overlapping; stagger end joints 12 inches minimum. Do not stretch or overlap sod pieces.

D. Where new sod adjoins existing grass areas, align top surfaces.

E. Where sod is placed adjacent to hard surfaces, such as curbs, pavements, etc., place top elevation of sod 1/2 inch below top of hard surface.

F. Water sodded areas immediately after installation. Saturate sod to 4 inches of soil.

G. 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 with roller not exceeding 100 lbs.

**END OF SECTION**

# SECTION 03100
# CONCRETE FORMS

## PART 1-GENERAL

1.1 GENERAL CONDITIONS:

A. All work under this section is subject to the General Conditions and Supplementary General Conditions and shall be governed by the requirements therein.

1.2 COOPERATION:

A. The contractor is cautioned to examine all drawings and specifications relating to other branches of the work, and he shall make proper provisions to receive all other work.

1.3 SCOPE:

A. Shall include formwork and related items required to complete the work indicated on the drawings and/or specified herein.

1.4 DESIGN OF FORMWORK:

A. Design and engineering of formwork, as well as its construction shall be the responsibility of the Contractor and shall comply with Chapters 2 and 3 of ACI-347, and applicable requirements of the controlling local building code.

1.5 NOTICE OF INSPECTION BY ARCHITECT:

A. The Contractor shall give the Architect advance notice, 72 hours before excavation or formwork will be ready for inspection. The Contractor shall also give a 24-hour second notice before excavations or formwork are complete and ready for inspection, including reinforcing steel and any other built-in material or equipment.

## PART 2-MATERIALS:

2.1 FORMS:

A. Form material shall be B-B Plyform EXT- DFPA for surfaces not exposed to view.

B. Form material shall be HDO EXT-DFPA, high density overlay plywood for exposed architectural concrete.

C. Commercially manufactured steel forms are acceptable.

D. Form ties shall have plastic cones to facilitate patching.

E. Form accessories to be partially or wholly embedded in concrete, such as ties and hangers, shall be commercially manufactured type. Wire is not acceptable. Portion remaining within concrete shall leave to metal within one inch of surface when concrete si exposed to view. Spreader cones on ties

shall not exceed one-inch diameter. All form accessories to be used in concrete having a face exposed to weather shall be galvanized.

## PART 3-EXECUTION:

3.1 WORKMANSHIP:

A. At contraction, expansion and construction joints, including keyways, neatly joint forms and securely set to exact grade and alignment. Provide sufficient rigidity and strength to resist pressure of concrete without springing, deflecting, or setting.

B. Accurately set edge forms and intermediate screed strips to produce designed elevations and contours in finished surface. Forms shall be sufficiently strong to support crating bridge screed or roller pipe screeds if nature of finish specified requires use of such equipment. Align concrete surface to contours of screed strips by use of strike-off templates or approved compacting type screeds.

C. Positive means of adjustment (wedges or jacks) of shores and struts shall be provided and all settlement shall be taken up during concrete placing operation. They shall be securely braced against lateral deflections.

3.2 TOLERANCES:

A. Construct formwork so as to insure that concrete surfaces will conform to tolerances of Section 2.4.1.

3.3 PREPARATION OF FORM SURFACES:

A. Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opened by shrinkage of wood shall be swelled until closed by wetting before concrete is placed.

B. Seal plywood and other wood surfaces subject to shrinkage against absorption of moisture from concrete by either a field applied commercial form oil or sealer or a factory applied non-absorptive liner.

C. When steel forms are coated to prevent bond with concrete, it shall be done prior to placing of reinforcement. Excess material shall not be allowed to come in contact with concrete against which fresh concrete will be placed.

D. Clean in all form surfaces before re-use.

3.4 EXAMINATION:

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.5 REMOVAL OF FORMS:

A. Formwork for columns, walls, sides of beams and other parts not supporting weight of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal operations.

B. Whenever formwork is removed during curing period, exposed concrete shall be cured by one of methods specified in Section 03300 - Cast In Place Concrete.

**END OF SECTION**

# SECTION 03110
# CONCRETE ACCESSORIES

## PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. All work under this section is subject to the General Conditions and Supplementary General Conditions and shall be governed by the requirements therein.

1.2 COOPERATION:

A. The contractor is cautioned to examine all drawings and specifications relating to other branches of the work, and he shall make proper provisions to receive all other work.

1.3 SCOPE:

A. Shall include all concrete accessories required to complete the work indicated on the drawings and/or specified herein.

## PART 2 - MATERIALS:

2.1 VAPOR BARRIER:

A. 10 mil thick, as manufactured by Stego Industries LLC, San Juan Capistrano, CA or approved equal. Accessories to include seam tape and vapor proofing mastic. Pipe boots shall be constructed from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

2.2 PREMOLDED EXPANSION JOINT:

A. Shall be asphalt impregnated expansion joint material to meet ASTM Specification D-1751-73.

2.3 NON-SHRINK GROUT:

A. Shall be Five Star Grout as manufactured by U.S. Grout Corp.

2.4 EXPANSION JOINT COVERS:

A. Refer to Section 05810 – Expansion Joint Cover Assemblies.

2.5 DOVETAIL ANCHOR SLOTS AND DOVETAIL ANCHORS:

A. Dovetail anchor slots shall be of 22 gage galvanized steel and shall be 1" by 1" deep with a 5/8" throat. Space at 16" o.c. horizontal unless noted.

B. Dovetail anchors shall be seismic Type 361 as manufactured by Heckman Building Products or equal. Provide at 16" o.c. vertically unless noted.

## PART 3 - EXECUTION:

3.1 WORKMANSHIP:

A. Control joints, expansion joint material and other embedded items shall be positioned accurately

and supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

B. Non-shrink grout: Place non-shrink grout under all steel bearing conditions, as shown on the drawings.

C. Dovetail anchors and anchor slots shall be provided along concrete walls with masonry shelves 1'-2" or deeper.

3.2 INSTALLATION OF VAPOR BARRIER:

A. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643:
1. Unroll vapor barrier/retarder with the longest dimension parallel with the directions of the pour.
2. Lap vapor barrier/retarder over footings and seal to foundation walls.
3. Overlap joints 6 inches and seal with manufacturer's tape.
4. Seal all penetrations including pipes per manufacturer's instructions.
5. No penetration of the vapor barrier/retarder is allowed except for reinforcing steel and permanent utilities.
6. Repair damaged areas by cutting patches of vapor barrier/retarder, overlapping damaged area 6 inches and taping all four sides with tape.

**END OF SECTION**

# SECTION 03200
# CONCRETE REINFORCEMENT

## PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. All work under this section is subject to the General Conditions and Supplementary General Conditions and shall be governed by the requirements therein.

1.2 COOPERATION:

A. This Contractor is cautioned to examine all drawings and specifications as relating to other branches of the work and he shall make proper provisions to receive all other work.

1.3 SCOPE:

A. Shall include all reinforcing required to complete the work indicated on the drawings and/or specified herein.

1.4 SHOP DRAWINGS:

A. Steel Fabricator shall submit five (5) hard copies of detailed shop drawings for approval by the Architect on reinforcing bars and anchor bolt setting plans before fabrication of shipment. Show all dimensions necessary for reference to Contract Documents. Also wall, beam, and column elevations showing placing of reinforcing steel shall be drawn for all concrete walls, beams, and columns.

## PART 2 - MATERIALS

2.1 ACCESSORIES:

A. Metal accessories, including spacers, chairs, ties and other devices necessary for properly assembling, placing, spacing and supporting all reinforcement in place shall be provided.

2.2 REQUIREMENTS:

A. Metal reinforcement shall be deformed bars (ACI 318), conforming to one of the following requirements. STM Standards for:
   1. Billet-steel bars for Concrete Reinforcement, A615, Latest Revision. Use Grade 60 if not specified.
   2. Welded Steel Wire Fabric for Concrete Reinforcement, A185 Revision.
   3. All reinforcing bars shall be clearly imprinted with the mill mark, bar size and steel type.

2.3 TENSION SPLICE DEVICES:

A. Zap Screwlok by Barsplice Products, Inc.

B. Quick-Wedge Mechanical Lap Splices by Erioc Products, Inc.

C. Lenton Taper Threaded Rebar Splices by Erioc Products, Inc.

## PART 3 - EXECUTION

3.1 GENERAL:

A. Metal reinforcement shall not be bent or straightened in a manner that will injure the materials. Bars with kinks and bends not shown on the plans will be rejected. All reinforcement shall be accurately placed as called for and tied securely with wire at intersections and at laps. All reinforcement needed in any one section shall be placed in position and inspected and approved by the Architect before concreting is begun, and every care taken not to disturb or misplace such reinforcing during the concreting operation. There shall not be less than 1-5/8" between bars, and parallel bars shall not be wired together.

3.2 WIRE WELDED FABRIC:

A. Unless otherwise noted on the drawings, all concrete slabs-on-grade, including floor and walk slabs, shall receive 6x6 - W1.4xW1.4 welded wire fabric. Fabric shall be placed in slabs slightly above center.

3.3 REQUIREMENTS:

A. All design, placement, laps, ties, accessories, etc. shall conform to the latest applicable requirements of ACI code.

B. Fabricating and Placing Tolerances - fabricate and place reinforcing to conform to tolerances set forth in Section 5.4 of ACI 301.

C. Reinforcing in walls and footings shall be continuous around corners.

D. Lap all steel 30 bar diameters or 18" minimum splices unless noted on plans otherwise.

E. Provide 2 #4 extra bars around all openings in concrete. Extend 2'-0" beyond edge of opening.

3.4 SPLICES:

A. All tension splices in hairpins and tie beam reinforcing shall be made by mechanical devices. All other splices shall have rebar lapped 30 bar diameters or 18" minimum splices unless noted on plans otherwise.

**END OF SECTION**

# SECTION 03300
# CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. All work under this section is subject to the General Conditions and Supplementary General Conditions and shall be governed by the requirements therein.

B. Related Sections:
1. Section 03354 – Polished Concrete
2. Section 3404 – Concrete Finishes
2. Section 09800 – Special Clear Protective Treatment

1.2 COOPERATION:

A. This Contractor is cautioned to examine all drawings and specifications relating to other branches of the work, and he shall make proper provisions to receive all other work. No structural concrete shall be cut or broken out by any of the trades without written permission from the Architect.

1.3 SCOPE:

A. Shall include all concrete work and related items required to complete the work indicated on the drawings and/or specified herein.

1.4 CHARACTER OF WORK:

A. Concrete shall be structurally sound, dense, free of honeycombs, planes of weakness or other defects and built to exact lines, shapes and levels shown. Concrete not meeting requirements of this specification will be rejected, removed and replaced. Faulty work may be repaired in lieu of removal and replacement only if written approval is given by Architect. The Contractor shall perform all removal, replacement or repair work to the approval of Architect at no expense to Owner.

B. The requirements of "Specifications for Structural Concrete for Building" (ACI 301) are a part of these specifications; its provisions shall govern this work except as noted on these Plans and Specifications.

1.6 SUBMITTALS:

A. Contractor shall submit five hard copies as per section 01300 of all products to be used and all proposed concrete mixes in accordance to section 03300 subsection 2.5 for approval by the architect.

## PART 2 - MATERIALS

2.1 STORAGE OF MATERIALS:

A. Provide proper space and storage shelter for the storage of materials which may be subject to weather conditions and damage. All lumpy, dirty or damaged cement shall be rejected. All cement and aggregate shall be stored and cared for in such a manner as to avoid inclusion of foreign materials. Frozen or partially frozen aggregates shall not be used.

2.2 PORTLAND CEMENT:

A. Shall conform to ASTM "Standard Specifications for Portland Cement" C-150, Type 1; or C175, Type 1A.

2.3 AGGREGATE FOR CONCRETE: Shall conform to ASTM "Standard Specifications for Concrete Aggregate" C-33, Latest Revision.

A. Fine aggregate shall be siliceous material and shall be clean, sharp, free from dust, silt, soft particles, vegetable loam, organic impurities, or other deleterious matter.

B. The maximum size of aggregate shall be no larger than one-fifth (1/5) of the narrowest dimension between sides of forms within which concrete is to be cast, nor larger than three-fourths (3/4) of the minimum clear spacing between reinforcing bars, or between reinforcing bars and forms. For unreinforced slabs, the maximum size of aggregate shall not be larger than one-third (1/3) the slab thickness.

C. Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials with similar characteristics or combination thereof, having clean, hard durable, uncoated particles free from deleterious matter. After acceptance of a grading, a variation in the amount passing any sieve size of more than 10 percent of the total will not be permitted, and the grading shall be within the following by weight:

Normal Weight

Passing a 1-1/4" sieve . . . . . 90 to 100 percent
Passing a 3/8" sieve . . . . . 20 to 55 percent
Passing a No. 4 sieve. . . . . 0 to 10 percent
Passing a No. 8 sieve. . . . . 0 to 5 percent

Concrete Masonry Fill

Passing a 1/2" sieve . . . . . 90 to 100 percent
Passing a 3/8" sieve . . . . . 40 to 70 percent
Passing a No. 4 sieve. . . . . 0 to 15 percent
Passing a No. 8 sieve. . . . . 0 to 5 percent

D. Concrete masonry fill may be mixed in the mason's mixers provided they submit a mix design from an approved testing laboratory.

2.4 MIXING WATER:

A. Shall be clean and free from all acid and injurious amounts of vegetable matter, alkalies, or other salts.

2.5 CONCRETE:

A. The proportion of ingredients shall be selected to produce the proper placability, durability, strength, and other required properties. The proportion of ingredients shall be such as to produce a mixture which will work readily into corners and angles of the forms and around reinforcement by the methods of placing and consolidation employed on the work, but without permitting the materials to segregate or excessive free water to collect on the surface.

| Kinds of Construction | Ult.Strength @28 Days(fc') | Slump Ins. | Max.Water-Cement/Ratio* | Air Entrain. |
|---|---|---|---|---|
| Interior: slabs on grade, & elevated slabs | 4000 psi | 4 | 0.50 | No |
| Pedestals, stem walls and footings | 3000 psi | 4 | 0.53 | Optional |
| Exterior: concrete slabs, curbs, & paving | 4000 psi | 4 | 0.50 | Yes |
| All Other | 3000 psi | 4 | 0.53 | Optional |

*Water-Cement ratio = #Water/#Cement.

B. Admixtures: No concrete additives other than air-entrainment and water reducer shall be allowed without written permission of Architect.

1. Air-entraining Admixtures:
   a. Air-entraining admixtures shall conform to Specifications for Air-Entraining Admixtures for Concrete (ASTM C260).
   b. The air content of air-entrained concrete shall conform to requirements set forth in the following table:

| Maximum Size Coarse Aggregate, Inches | Air Content Percent by Volume |
|---|---|
| 1-1/2, 2 or 2-1/2 | 5 +/- 1 |
| 3/4 or 1-1/2 | 6 +/- 1 |
| 3/8 or 1/2 | 7-1/2 +/- 1 |

2. Water Reducer: Shall conform to ASTM (C-494).
3. Contractor is responsible for admixture compatibility in order to produce concrete described in Sub-section A. above.

C. The Contractor shall submit, through an approved independent testing laboratory, the proposed concrete mixes to be used prior to placing any concrete on the project. Concrete proportions for these mixes, including water-cement ratio, shall be established with materials to be employed on the basis of:

1. Field experience as per ACI-318, Sec.5.3.
2. Where a production facility does not have 30 consecutive tests meeting the requirements of ACI-318, Sec. 5.3, trial batches shall be made. The proposed concrete mixes must be approved by preliminary cylinder tests. These proving tests shall consist of at least 4 cylinders for each specific mix. Control test cylinders shall be made and stored in accordance with ASTM C-31. The average compressive strength of these 4 cylinders shall be 1200 psi greater than the Ult. Strength at 28 days (fc').
3. The owner shall pay for all design mixes and cylinder tests.

D. Concrete shall be transit-mixed concrete and conform to Mixing and Transportation portion of the ASTM "Standard Specification for Ready-Mixed Concrete", C-94. The time from introduction of water to discharge shall not be more than 45 minutes. The concrete producer shall furnish duplicate delivery tickets with each load of concrete delivered to the project, listing all ingredients and amount of ingredients in the mix, slump and time of introduction of water.

2.6 CURING COMPOUND:

A. 1100-Clear as manufactured by W.R. Meadows shall be used on all exterior concrete slabs and interior slabs not to be polished unless noted on plans or as noted below. 1100-Clear curing compound shall not be applied to slabs to receive floor hardener.

B. Interior slabs to be moisture cured.

**PART 3 - EXECUTION**

3.1 INSTALLATION:

A. Depositing Concrete
1. Place no concrete until reinforcing steel, pipes, conduits, sleeves, hangers, anchors, waterproofing and other work required to be built into the concrete has been inspected and approved by the Architect.
2. Remove water and foreign matter from forms and excavations. Unless otherwise directed, thoroughly wet wood forms, sand, and earth just prior to placing concrete on them. Compact soil under slabs on ground to firm unyielding surface. Place no concrete for foundations on disturbed footing.
3. Transport concrete from mixer to place of final deposit as rapidly as practical by methods which prevent separation of ingredients and displacement of reinforcement, and which avoid rehandling. Deposit no partially hardened concrete. Concrete shall be compacted by mechanical vibration. Care shall be exercised so that concrete shall not be over-vibrated to the extent that segregation of the aggregates will occur.
4. Cold Weather Requirement. When air temperature is 40 degrees F. or below, concrete temperature shall be between 60 and 90 degrees F. when placed and shall be maintained at not less than 50 degrees F., for at least 72 hours. Pour no concrete on frozen soil. Cold weather concreting shall be performed according to ACI-306, "Cold Weather Concreting".
5. Hot Weather Concreting. When the temperature rises above 95 degrees F. at any time during the day, the Contractor shall place no concrete without permission of the Architect. When weather conditions warrant, and/or the Architect requires, concrete placement shall cease to be performed according to ACI-305, "Hot Weather Concreting".
6. No water shall be added at the construction site without the permission of the Architect.
7. Conveying of the concrete directly over the steel re-enforcement will not be allowed. Raised runways above the top of such reinforcement as well as the top of finished slab shall be required in all places where wheeled conveyers are used.
8. All trench ducts, floor drains, J-boxes, cleanouts, etc., installed in floor slab, shall be pre-set in required location at correct elevation prior to final concrete pour.
9. All trades with equipment in concrete slab shall be present during pour.

B. Screeds. Use temporary pipe screeds as required. Use 1-1/4" o.c. black pipe on adjustable chairs at 48" o.c. Wet screeds are not acceptable on slabs on grades. Wood stakes under pipe screeds are not acceptable.

C. Curing and Protection
1. Protect all concrete work and cement finishes against injury from the elements and defacement of any nature during construction operations. Floors shall be protected from face damage, both defacement and chemical.
2. Vertical surfaces of walls and foundations shall be kept formed or wet for a period of seven days after pouring.
3. Unless otherwise specified, curing compound shall be applied to all interior concrete slabs, steps, etc., to meet manufacturer's specifications. Curing compound shall be applied

evenly and uniformly when the surface is damp but not wet and can no longer be marred by walking workmen.

4. On slabs to receive special floor finishes the slabs shall be moisture cured by one of the following methods for a minimum of 7 days.
   a. Applying a minimum of 1-1/2" of clean sand over the freshly placed concrete slab. Sand shall be kept wet for 7 days.
   b. Application of absorptive mats of fabric kept continuously wet.
5. Curing compound shall be applied to all exterior concrete slabs, steps, curbs, etc., to meet manufacturer's specifications. Apply at a rate of 200 sq. ft. per gallon. Curing compound shall be applied evenly and uniformly when the surface is damp but not wet and can no longer be marred by walking workmen.

3.2 TESTING:

A. General
1. All materials and equipment used in construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be approved by Architect prior to starting concrete operations. At Contractor's expense, a certified ACI technician shall take test cylinders at the job site. The owner shall pay for all other services of the testing agency described in this section unless noted otherwise.
2. Materials of construction, particularly those upon which the strength and durability of the structure may depend, shall be subject to inspection and testing to establish conformance with specifications and suitability for uses intended.

B. Testing Services
1. The designated testing agency shall:
   a. Review Contractor's proposed mix design and materials.
   b. If the proposed mix design meets the quantities and requirements of the specification, the agency shall check test the Contractor's proposed mix design.
   c. Test the Contractor's proposed materials for compliance with the specifications if deemed necessary and with the approval of the Architect.
   d. Secure production samples of materials at plants or stockpiles during the course of work and test for compliance with specifications if deemed necessary and with approval of the Architect.
   e. Conduct strength tests of the concrete in accordance with following procedures:
      1) Cure specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexure Specimens in the Field" (ASTM C31).
      2) Test on specimen at 7 days in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C39). The 7-day test shall be at least 60% of the 28-day design strength.
      3) Test one specimen at 14 days in accordance with " Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C39). The 14-day test results shall be at least 80% of the 28-day design strength.
      4) Test 3 specimens at 28 days in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C39). The 28-day test result shall be average of strengths of the 3 specimens.
      5) Make one strength test for each 100 cu. yds. or fraction thereof for any class of concrete placed in any one day, except that in no case shall a given class be represented by less than five (5) tests. Except for reinforced masonry columns, grade beams, and floor slabs, concrete pours of less than ten yards need not be tested.

f. Report all test results to Architect's Field Representative and Contractor on same day that tests are made.

2. The testing agency may also perform the following additional services if Architect's Field Representative desires, the cost of which will be borne by the Contractor if the methods or the materials fail to meet the above specs.
   a. Check batching and mixing operations to the extent deemed necessary by Architect's Field Representative.
   b. Review the manufacturer's reports of each shipment of cement and reinforcing steel and/or conduct laboratory tests or spot checks of these materials as received.
   c. If average compressive strength of the three 28-day specimens, from a given sample, do not meet the above specifications, the in-place hardened concrete shall be tested. These in-place concrete tests shall be determined by the Architect and shall consist of testing of drilled cores or impact hammer or both. The number of tests and locations shall be determined by the Architect. The drilled cores shall be taken in accordance with "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete". (ASTM C42). These additional tests will be paid for by the contractor.

C. Authority and Duties of Testing Agency.
1. Technicians representing the testing agency shall inspect the materials and the manufacture of concrete and shall report their findings to Architect's Field Representative and the Contractor. When it appears that the material furnished or work performed by the Contractor fails to fulfill specification requirements, the technicians shall direct the attention of the Architect's Field Representative and the Contractor to such failure.
2. The technicians shall not perform other duties for Contractor unless the services are paid for by the Contractor.
3. Work will be checked as it progresses, but failure to detect any defective work or materials shall not in any way prevent later rejection when such defect is discovered, nor shall it obligate Architect's Field Representative to final acceptance.
4. Technicians are not authorized to revoke, alter, relax, enlarge or release any requirements of the specifications, not to approve or accept any portion of work.

D. Responsibilities and Duties of Contractor.
1. The use of testing services shall in no way relieve the Contractor of his responsibility to furnish materials and construction in full compliance with the plans and specifications.
2. To facilitate testing services, the Contractor shall:
   a. Prior to concrete operations, provide both the testing agency and concrete supplier with a copy of SECTION 03300 of the specification.
   b. Secure and deliver to Architect or his testing agency without cost, preliminary representative samples of the materials he proposes to use, and which are required to be tested.
   c. Submit through testing agency to Architect the Concrete Mix Design he proposes to use, and make written request for approval.
   d. During concreting operations at site, provide testing agency with strength test samples according to the following procedures:
      1) Secure concrete samples from batch in accordance with "Method of Sampling Fresh Concrete" (ASTM C172). Note one strength test or sample will include 5 specimens or 5 test cylinders.
      2) Mold 5 specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexure Specimens in the Field" (ASTM C31), and cure under Standard Moisture and Temperature Conditions in accordance with Sections 7.1, 7.2, and 7.3 of ASTM C31.
      3) Make one strength test for each 100 cu. yds. or fraction thereof for any class of concrete placed in any one day, except that in no case shall a

given class be represented by less than five (5) tests. Except for reinforced masonry columns, grade beams, and floor slabs, concrete pours of less than ten yards need not be tested.

e. Furnish such casual labor as is necessary to obtain and handle samples at the project or at other sources of material.

f. Advise the testing agency sufficiently in advance of operations to allow for completion of quality tests and for assignments of personnel.

g. Provide and maintain adequate facilities for safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours as required by ASTM C31.

h. Deliver test specimens to laboratory for testing as per ASTM C31. Specimens shall be protected from physical damage, including freezing and drying, during shipping.

i. Furnish copies of mill test report of all shipments of cement to Architect and testing agency if required.

E. Evaluation of Test Results

1. Test results shall be evaluated separately for each specified strength.
2. If the number of tests conducted is less than outlined on Paragraph 3.2.4.2, the Architect has the option to reject the untested concrete or require in-place concrete test. The cost associated with either option will be paid by the contractor.
3. Test results obtained by use of an impact hammer or sonoscope, unless correlated with other test data, shall not be considered conclusive in evaluating strengths of concrete.
4. Evaluation shall be valid only if tests have been conducted in accordance with procedures specified herein.

3.3 CLEANING:

A. Clean all exposed surfaces and adjoining work stains by leakage of concrete, and point all exposed joints in concrete work to the approval of the Architects.

3.4 CODE REQUIREMENTS:

A. All work, including forms, reinforcing, placing, laps, ties, accessories, etc., as well as the aggregate, design, mix, transportation, placing, finishing curing, protection, etc., as, all concrete work, shall conform to the latest published codes and recommendations of the American Concrete Institute, which are hereby made a part of this specification as if here copied in their entirety.

**END OF SECTION**

**SECTION 03304**
**CONCRETE FINISHES**

## PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. All work under this section is subject to the General Conditions and Supplementary General conditions and shall be governed by the requirements therein.

1.2 COOPERATION:

A. This Contractor is cautioned to examine all drawings and specifications relating other branches of the work, and he shall make proper provisions to receive all other work.

1.3 SCOPE:

A. Shall include all labor and materials required to complete the work indicated on the drawings and/or specified herein.

1.4 QUALITY ASSURANCE:

A. Concrete flatwork shall be performed utilizing high quality techniques conforming to American Concrete Institute Standards provided for by ACI Publication CP-10, Concrete Flatwork Technician and Flatwork Finisher, ACI Publication CCS-1, Concrete Craftsman Series Slabs on Grade.

B. All concrete installation shall be performed by at least one ACI Flatwork Finisher or Technician currently certified with ACI.

C. All projects greater than 10,000 square feet will require at least two ACI Flatwork Finishers or Technicians currently certified with ACI.

1.5 SUBMITTALS:

A. Provide ACI certification documentation for all finishers who will be installing concrete prior to starting any concrete operations.

B. Contractor shall submit one hard copy (not to be returned) and one electronic copy in PDF format as per section 01340 of concrete products to be used for approval by the architect.

1.6 PRE-WORK CONFERENCE:

A. Within two weeks prior to the placement of any finished concrete, a pre-work conference shall be held at the job site with the following in attendance: Architect's Representative, Contractor's Job Superintendent, finishing sub-contractor, and all sub-contractors applying floor coverings and/or special floor finishes. This meeting will serve the following purposes: To discuss plans and specifications and clarify any questions pertaining to concrete finishes and floor coverings, and to transfer ideas as to what the Architect will expect from all trades and ideas that the sub-contractors may have on their portion of the job.

## PART 2 - MATERIALS

2.1 FLOOR SEALER:

A. Apply to all exposed interior concrete floors not to be polished.

B. Material: MasterKure CC 180WB (formerly "Kure-N-Seal"), as manufactured by BASF or equal..

C. Application: Within one week of substantial completion, apply two coats of sealer in accordance with the manufacturer's printed instructions at a rate of 400 SF/gal.

2.2 POLISHED CONCRETE:

A. Verify areas to be Polished Concrete with the Finish Schedule on drawings.

B. Finisher to provide finished concrete as required to accept Polished Concrete as noted in specification section 03354.

C. Refer to specification section 03354 for Polished Concrete.

**PART 3 - EXECUTION**

3.1 FINISHING CONCRETE:

A. Immediately after removing forms, all concrete surfaces shall be inspected and any poor joints, voids, or stone pocket surfaces and other defective areas shall be patched and placed in good condition.

B. All exposed surfaces of foundation walls, retaining wall, interior walls and edges of turned down slabs shall be formed on plywood with a smooth finish. Rub as necessary to remove fins and projections. Fill all voids to leave surface smooth.

C. Concrete with applied coating shall be formed on plywood. Rub as necessary to remove fins and projections. Fill all voids to leave surface smooth and acceptable to receive applied coating.

D. Floor Flatness and levelness of interior slabs: see section 03362.

E. Exterior steps, porches, walls, etc., shall be smoothed with a steel trowel, followed by a brushed finish for non-slip surface. Steps shall have edges rounded with a steel edging tool.

F. All exterior concrete slabs shall be sloped to provide water drainage. Any exterior concrete that holds water puddles shall be removed and replaced by the Contractor at his expense.

3.2 Floor Flatness and levelness of interior slabs: The finished concrete surface shall have a minimum value as specified in section 03354 and measured in accordance to ASTM E 1155. Grind down any surface defects that would telegraph through applied floor covering. Use a "Dipstick" or other approved method for measurement of floor flatness and levelness. The contractor shall provide a written report to the Architect within 48 hours of completion of each pour.

3.3 SURFACE DEFECTS:

A. Surface defects which do not impair the structural strength shall be carefully cut out and refilled with fresh concrete. Cuts shall not be less than one inch (1") deep and thoroughly wetted just prior to filling with concrete of stiff consistency and mixed approximately the same as the adjoining work. After partial set, compress and rub to produce a finish similar in texture and color to adjoining work.

**END OF SECTION**

**SECTION 03354**

**POLISHED CONCRETE**

## PART 1 – GENERAL

1.1 SUMMARY:

A. POLISHED CONCRETE FINISHING

1. Work in this Section applies to the mechanical polishing of interior concrete floor surfaces. Verify flatness and levelness of concrete slabs meet or exceed Specified Overall Values (SOV) of flatness F(F) 50 and of levelness, F (L) 35; with Minimum Local Values (MLV) of flatness, F(F) 30; and of levelness, F(L) 20. Do not proceed until unsatisfactory conditions are corrected. Floor grinding and polishing shall be started using a metal disc, as needed to remove all low spots and trowel marks. No low spots or trowel marks are to be left in the slab. A concrete grinding machine with planetary or counter-rotating heads must be used.

B. Section Includes:

1. Concrete Floor Polishing System including:
   a. Surface preparation.
   b. Densifying agent.
   c. Polished concrete floor finish for Interior use.
   d. Concrete Sealer
   e. Polishing System.
   f. Stain Protection
   g. Joint filler.

C. Related Sections:

1. Division 3 Section Cast-In-Place Concrete for concrete floor slab formwork, reinforcement, concrete materials, mixture design, placement procedures, flatness and levelness, and trowel finishes.
2. Division 9 – Sectin 09800 – Special Clear Protective Treatment.

1.2 REFERENCE STANDARDS:

A. ASTM 4039 Standard Test Method of Reflection Haze of High-Gloss Surfaces

B. ASTM D5767 Standard Test Method for Instrumental Measurement of Distinctness of Image Gloss of Coating Surfaces

C. A CI 310 Guide to Decorative Concrete

D. AS TM D2047 Standard Test for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.

E. ANSI B101.1 Floor Safety Standard

F. ANSI B101.3 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials

G. ASTM D523 Standard Test Method for Specular Gloss

1.3 SUBMITTALS:

A. Product Data:

1. For each type of product and system indicated:
   a. Submit manufacturer's polishing system specifications.
   b. Submit products to be provided, giving manufacturer's name and product name for the specified materials proposed to be provided under this Section.
   c. Submit manufacturer's recommended installation procedures; which when approved by the Architect Engineer, will become the basis for accepting or rejecting actual installation procedures used on the work.
      1) Include proposed grinding equipment, vacuum systems, and diamond tooling for approval.
   d. Submit technical data sheet giving descriptive data, curing time and application requirements.
   e. Submit recommended maintenance and repair instructions for the installed floor system.

B. Installer Qualifications Data:

1. Submit Installer qualifications, references, and certifications as indicated.

1.4 EXTRA STOCK:

A. Repair Materials:

1. Furnish 5 gallons of the stain blocker and repair instructions to the technical inspector for future repair by the Owner. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.5 QUALITY ASSURANCE:

A. Regulatory Requirements

1. Accessibility Requirements: Comply with applicable requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAGs) for Building Facilities; Final Guidelines, revisions, and updates for static coefficient of friction for walkway surfaces.
2. Environmental Requirements: Comply with current Federal and local toxicity and air quality regulations and with Federal requirements on content of lead, mercury, and other heavy metals. Do not use solvents in floor polish products that contribute to air pollution or impact food quality.

B. Manufacturer Qualifications:

1. A firm with a minimum of 5 year's experience in manufacturing concrete floor polishing product systems.
2. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.
3. CPAA certified Craftsman Level Polisher or higher.

C. Installer Qualifications:

1. A firm that is regularly engaged in the installation of polished concrete floor system with a minimum of 3 year's experience with proposed system. Furnish documentation of successful completion of a minimum of five projects with proposed system on projects of similar magnitude and complexity. The installer shall have been certified in writing by the special concrete floor finish manufacturer within 12 months prior to start of this project, certifying that the installer is:

a. Current on the latest application means and methods of special concrete floor finish.
b. Eligible to receive manufacturer's special warranty.

2. The special concrete finish manufacturer shall certify, in writing, that the installer designated for this project is qualified for the scope of this project and has qualified personnel to perform the work.

D. Source Limitations:
1. Obtain each type of material for Special Concrete Floor Finish System from one source approved by Special Concrete Floor Finish System Manufacturer with resources to provide materials of consistent quality in appearance and physical properties.

E. Mockups:
1. Provide benchmark sample of Special Concrete Floor Finish System to verify finish indicated and to demonstrate aesthetic effects and set quality standards for materials and execution, i.e., typical joints, surface finish, color variation (if any), and standard of workmanship.
a. Provide mock-up of approximately 250 square feet at location directed by the Architect Engineer.
b. Notify Architect Engineer and special concrete floor finish manufacturer seven days in advance of date and time when mock-up will be constructed.
c. Measure the slip resistance of mock-up and obtain approval of the Architect Engineer and Owner before starting application of special concrete floor finish. Mockup finish shall be finished to Level 3.
d. Measure the finish level of mock-up and obtain approval of the Architect Engineer and Owner before starting application of special concrete floor finish. If the mock-up does not meet requirements and/or is not approved by the Architect Engineer and Owner, re-polish floor sample until mock-up is approved by the Architect Engineer and Owner, re-polish floor sample until mock-up is approved.
e. Maintain mock-up during construction in an undisturbed condition as a standard for judging the completed work.
f. Approved mock-up may become part of the completed work if undisturbed at time of substantial completion.
g. Apply benchmark sample after permanent lighting and other environmental services have been activated.

F. PRE-PURCHASE AND PREINSTALLATION CONFERENCES:
1. The installer shall participate telephonically before the placement of the concrete slab related to this Section with the General Contractor, and technical inspector to review requirements necessary for a successful polished floor surface.
2. The installer shall conduct a conference at the Project site to comply with requirements in Division 01 Section Administrative Requirements.
a. Include Architect Engineer, Contractor, Installer, Concrete Subcontractor, and Special Concrete Floor Finish System Manufacturer's representative to establish guidelines and expectations for finished concrete work including floor flatness, levelness, and finished appearance of troweled floor slab.
b. Unacceptable finishes include blisters, ghosting, cracking, crazing, curling, delamination, surface discoloration, dusting, efflorescence, popouts, scaling and spalling.

c. Review methods and procedures related to the Special Concrete Floor Finish System including, but not limited to, the following protection precautions:
   1) No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete floor surface. Prevention is therefore essential.
   2) Diaper hydraulic powered equipment to avoid staining concrete.
   3) Do not park vehicles on concrete slab. Place drop cloths under vehicles if it is necessary to park vehicles on concrete slab to complete work.
   4) Do not use pipe cutting machines on the concrete floor slabs.
   5) To avoid rust staining do not place steel on concrete floor slab.
   6) Do not allow acids and acidic detergents to come into contact with concrete floor slab.
   7) Inform all trades that the concrete floor slab must be protected at all times.
   8) Equip lifts with non-marking tires.
   9) Do not use poly sheeting PVC or plastic protection sheets as cover or protection of finished floor.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in original containers, with seals unbroken, bearing manufacturer labels indicating brand name and directions for storage. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.7 PROJECT CONDITIONS:

A. General
   1. Close spaces to traffic during Special Concrete Floor Finish System application.

B. Environmental Limitations:
   1. Comply with Special Concrete Floor Finish System manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting Special Concrete Floor Finish System application.

C. Grinding Operations:
   1. Planetary or counter rotating 3 head and 4 head variable speed floor grinder. Minimum size of grinding head shall be 32-inch diameter. Tilt-back machines shall be used grinding and polishing operations.
   2. Dust extraction system for above grinders incorporating HEPA filters.
   3. Protect adjacent construction from detrimental effects of grinding operations.
   4. Hand or edge grinders with dust extraction or dust suppression attachment.
   5. Grinding heads must include both metal bonded diamonds and resin bonded diamonds using flexible head system.
   6. High speed burnisher with minimum 2500 RMN and minimum 20-inch diameter head.
   7. Diamond impregnated burnishing pads.
   8. Provide dustproof partitions and temporary enclosures to limit dust migration and to isolate areas from noise.
   9. All grinding diamonds used shall be approved by concrete polishing system manufacturer.

1.8 WARRANTY:

A. Special Warranty:
1. Manufacturer's standard form in which manufacturer agrees to repair or replace Special Concrete Floor Finish System that fails in materials or workmanship within specified warranty period.
a. Special warranty includes penetrating liquid concrete floor densifying agent, joint filler, finish, and other components of Special Concrete Floor Finish System.
b. Warranty Period: 10 years from date of Substantial Completion.

**PART 2 – PRODUCTS**

2.1 MANUFACTURERS:

A. Basis-of-Design Products: To establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, a specific manufacturer's products and system are named and accompanied by the words "basis of design, "including make or model number or other designation. Subject to compliance with requirements, provide either the named products or equal products.

B. Substitutions per Section 01600 – Product Requirements.

2.2 SPECIAL CONCRETE FLOOR FINISH SYSTEM:

A. Special Clear Protective Treatment
1. See Section 09800

B. Penetrating Liquid Floor Densifying Agent:
1. Clear, chemically reactive, waterborne solution of inorganic materials, catalyzed sodium silicate, and proprietary components; odorless and colorless; that penetrates, hardens, and densifies concrete surfaces. Do not use siliconates, meta silicate, siloxane or inorganic siloxane, magnesium fluorosilicates.
a. Basis-of-Design Products:
1) Advanced Floor Products, Inc.; Retro-Plate 99; (773) 622-2444 and www.retroplatesystem.com http://www.retroplatesystem.com

C. Concrete Polishing System:
1. Patented process of metal bond diamond grinding and polishing in graduated grits from coarse to fine.
2. Basis-of-Design System:
a. Advanced Floor Products, Inc.; Retro-Plate Concrete Polishing System; (773) 622-2444 and www.retroplatesystem.com <http://www.retroplatesystem.com> .
b. Aggregate Exposure:
1) Class B: Mott led salt and pepper aggregate exposure. Approximate Surface Cut Depth 1/16".
c. Finish Definition
1) Level 3: Semi-Polished to be used with stain repellant.
(a) Reflective Sheen with a Gloss Meter Reading of 50 or better.
(b) Reflective Clarity with a DOI of 40 or better.
2) Level 2: to be used with concrete sealer

(a) Reflective Sheen with a Gloss Meter Reading of 25 or better.
(b) Reflective Clarity with a DOI of 30 or better.

d. Level of Finish shall be Measured for Verification and approved by the Architect, Engineer and Owner prior to the application of stain protection.

3. The Basis-of-Design Special Concrete Floor Finish System manufacturer shall comply to the following performance criteria:
   a. General:
      1) Coefficient of Friction: All levels of finish exceed OSHA and ADA recommendations per ASTM C 1028.

2.3 STAIN REPELLENT:

A. Penetrating Stain Repellent:
   1. Non-film forming, water-based, penetrating stain repellent specifically formulated for the protection of polished concrete from oil and water-based stains.
   2. Basis-of-Design Products:
      a. Advanced Floor Products, Inc.; RetroGuard; (773) 622-2444 and www.retroplatesystem.com **<http://www.retroplatesystem.com>** .

2.4 JOINT FILLER:

A. Semi-Rigid Polyurea Joint Filler:
   1. Rapid setting, 100 percent solids, flexible, two part polyuria joint filler with a Type A Shore durometer hardness of at least 65 per ASTM D 2240 when cured. Designed to fill and protect joints in industrial floors that are subject to traffic such as trucks, forklifts or steel wheeled carts.
   2. Color: Custom color to match dyed polished concrete.
   3. Color: Custom color to match polished concrete.
   4. Basis-of-Design Product: Advanced Floor Products, Inc.; Crete-Fill Pro 65; (773) 622-2444 and www.retroplatesystem.com. HiTech Polyurea systems
   5. Performance Criteria:
      a. Tensile Strength: 740 psi minimum per ASTM D 412-98.
      b. Sets rapidly and consistently in application temperatures ranging from minus 20 deg F to 130 deg F.
      c. Elongation: 420 percent minimum.
      d. Hardness: 65 (Shore A) per ASTM D 2240-02.

**PART 3 - EXECUTION**

3.1 GENERAL:

A. Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting performance.

B. Verify concrete floor slab has cured a minimum of 45 days or as directed by the manufacturer before beginning application of system.

C. Apply Special Concrete Floor Finish System at least 10 days prior to installation of equipment; provide a complete, uninhibited concrete slab for application.

D. Close areas to traffic during floor application and for amount of time recommended by manufacturer after application.

3.2 SURFACE CONDITIONS:

A. Examine substrate, with special floor finish installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.
   1. Verify flatness and levelness of concrete slabs meet or exceed Specified Overall Values and levels recommended by manufacturer. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that concrete floor slab meet finish and surface profile requirements in Division 03 Section Cast-In-Place Concrete.

C. Prior to application, verify that floor surfaces are free of construction laitance.

3.3 APPLICATION GENERAL:

A. General:
   1. Start floor finish applications in presence of manufacturer's representative.
   2. Densifying and polishing of concrete surface.
      a. Only a certified applicator shall apply the penetrating liquid densifying agent. Applicable procedures shall be followed as recommended by the product manufacturer and as required to match approved benchmark sample.
      b. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
      c. Polish to required sheen level.
      d. Measure and verify Finish Level and obtain approval from Architect Engineer and Owner prior to application of stain protection.

3.4 POLISHING SYTEM:

A. Repair and fill all cracks.

B. Thoroughly clean the floor surface as required by manufacturer's instructions.

C. Start the process with the appropriate metal diamond grinding head (for example: 40, 80, 120 grit) depending on condition of concrete floor slab. Continue with additional grinding steps as necessary to achieve a consistent and uniform salt and pepper concrete slab appearance (showing sand aggregate only) and void of random scratches. All metal bond grinding shall be performed wet.

D. Install penetrating densifier at a rate of 200 square feet per gallon, scrubbing product into floor and allowing product to soak unit turning slick, leaving the product on floor for a minimum of 60 minutes. Remove excess material using water to neutralize product and dispose of IAW environmental regulations.

E. Begin the polishing process with a 100 grit resin bonded diamond grinding head followed in succession with a 200, 400, 800 resin bonded diamond grinding head as necessary, to achieve specified sheen. Stop at 400 resin bonded diamond grinding head for level 2 finish.

F. Progressive edge grinding will be necessary within 1/2" of all vertical abutments, including walls, columns, posts, etc.

G. Use had grinders and burnishers along edges and other areas of floor slab, exposed to view, that are not reachable using a planetary floor grinder.

3.5 APPLICATION OF CONCRETE SEALER:

A. See section 09800

3.6 STAIN PROTECTION:

A. Preparation
1. Complete all densification, grinding, and polishing before application of stain repellent.
2. Clean substrate of substances that might interfere with penetration or performance of statin repellent. Check surface for water, according to stain repellent manufacturer's written instructions, to ensure that surface is totally dry.
3. Install per manufacturer requirements.
a. Remove oil, laitance, and other substances that could prevent adhesion or penetration of stain repellent.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Application:
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of stain repellent and to instruct Applicator on the product and application method to be used. Comply with manufacturer's written application instructions.
a. Apply two light "film" coats with application devices recommended by manufacturer's field representative. Apply second coating, repeating first application. Burnish floor between applications. Comply with manufacturer's written instructions for limitations on drying time between coats.

3.7 JOINT FILLING:

A. General:
1. Prepare, clean, and install joint filler according to manufacturer's written instructions and the following requirements.
a. Defer joint filling until after concrete floor polishing and application of stain protection are completed. Do not fill joints until construction traffic has permanently ceases in areas receiving joint filler.
b. Remove all foreign material from joint substrates that could interfere with adhesion of joint filler, including dust, paints (except for permanent, protective coatings tested and approved for filler adhesion and compatibility by joint filler manufacturer), old joint sealants and fillers, grease, dirt debris, and saw cuttings; leave contact faces of join clean and dry.
c. Clean out joints with a diamond impregnated saw blade equipped with a dustless vacuum system to ensure sides of joint walls are clean so that joint filler can bond with them.

2. Install joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with floor surface after hardening.

3.8 WORKMANSHIP AND CLEANING:

A. General:
1. Keep premises clean and fee of debris at all times.
2. Remove spatter from adjoining surfaces that are to remain exposed.
3. Repair damages to surfaces caused by cleaning operations.
4. Remove debris from job site.

3.9 PROTECTION:

A. Protect finished work by General Contractor until project is turned over to the Owner.

**END OF SECTION**

**SECTION 04065**
**MORTAR AND MASONRY GROUT**

## PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Mortar for masonry.

B. Grout for masonry.

1.2 REFERENCES:

A. ASTM C 91 - Standard Specifications for Masonry Cement; 1999.

B. ASTM C94/C 94 M - Standard Specifications for Ready-Mixed Concrete; 2000.

C. ASTM C 144 - Standard Specifications for Aggregate for Masonry Mortar; 1999.

D. ASTM C 150 - Standard Specification for Portland Cement; 1999a.

E. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (Re-approved 1997).

F. ASTM C 387 - Standard Specification for Packaged, Dry Combined Materials for Mortar and Concrete; 1999.

G. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 1996.

1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C 270 is to be used. Also include required environmental conditions and admixutre limitations.

C. Samples: Submit two samples of mortar, illustrating mortar color and color range.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.4 SYSTEMS REQUIREMENTS:

A. Mortar and Masonry Grout shall meet Specification for Masonry Structures, ACI 530.1-02/ ASCE 6-02/ TMS 602-02.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Maintain packaged materials clean, dry and protected against dampness, freezing, and foreign matter.

1.6 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.

**PART 2 - PRODUCTS:**

2.1 MATERIALS:

A. Masonry Mortar: ASTM C 91, Type S or M.
1. Colored mortar: Premixed cement as required to match Architect's color sample.
2. Acceptable product: Lonestar
3. Colored mortar: Premixed cement as required to match existing color.
4. Substitutions: See Section 01600 - Product Requirements.

B. Portland Cement: ASTM C 150, Type I - Normal; standard gray color.

C. Packaged Dry Mortar: ASTM C 387, Type M, using gray color cement.

D. Hydrated Lime: ASTM C 207.

E. Quicklime: ASTM C 5, non-hydraulic type.

F. Mortar Aggregate: ASTM C 144.

G. Pigments for Colored Mortar: Iron or chromium oxides with demonstrated stability and colorfastness. Match existing building.

H. Water: Clean and potable.

I. Bonding Agent: Latex type.

2.2 MORTAR MIXES:

A. Mortar for Unit Masonry: ASTM C 270, Property Specification, Type S.

B. Mortar below grade and in contact with earth, Type M.

C. Pointing Mortar: ASTM C 270, Type S, using the Property Method.

2.3 MORTAR MIXING:

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use.

B. Maintain sand uniformly damp immediately before the mixing process.

C. Add mortar color and admixtures in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two hours of mixing.

F. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.4 GROUT MIXES:

A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide premixed type in accordance with ASTM C 94.

2.5 GROUT MIXING:

A. Mix grout in accordance with ASTM C 94/C 94M.

B. Thoroughly mix grout ingredients in quantities need for immediate use in accordance with ASTM C 476 for fine grout.

**PART 3 - EXECUTION:**

3.1 PREPARATION:

A. Apply bonding agent to existing concrete surfaces.

3.2 INSTALLATION:

A. Install mortar in accordance with mortar manufacturer's instructions.

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.

3.3 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 12 inches.
2. Limit height of masonry to 16 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.

3.4 FIELD QUALITY CONTROL:

A. Section 01400 - Quality Requirements: Procedures for Testing.

B. Testing - Masonry Grout: Conduct strength tests in accordance with ASTM C 1019.
1. Take two strength samples for each 5000 s.f. of masonry wall surface for each type of grout placed each day.

**END OF SECTION**

# SECTION 04080
# MASONRY REINFORCEMENT SYSTEMS

## PART 1 - GENERAL - NOT USED

## PART 2 - PRODUCTS:

### 2.1 MANUFACTURERS:

A. Acceptable Manufacturers: Hohmann & Barnard, Inc.; 30 Rasons Courts, P.O. Box 5270, Hauppauge, N.Y. 11788-0270; Telephone: 516-234-0600, Fax: 516-234-0683.

## PART 3 - EXECUTION - NOT USED

**END OF SECTION**

# SECTION 04810
# UNIT MASONRY ASSEMBLIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Split-Face Concrete Masonry Units.

B. Mortar and Grout.

C. Reinforcement and Anchorage.

D. Accessories.

### 1.2 REFERENCES:

A. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1997a.

B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.

C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.

D. ASTM C 129 - Standard Specification for Non-loading bearing Concrete Masonry Units; 1999a.

E. ASTM C 150 - Standard Specification for Portland Cement; 1999a.

F. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 1991 (re-approved 1997).

G. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 1999b.

H. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout; 1997.

I. ASTM C 476 - Standard Specification for Grout for Masonry; 1999.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data for masonry units and mortar. Include net area compressive strength.

### 1.4 SYSTEM DESCRIPTION:

A. Unit Masonry Assemblies shall meet Specification for Masonry Structures, ACI 530.1-99/ ASCE 6-99/ TMS 602-99.

### 1.5 DELIVERY, STORAGE, AND HANDLING:

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

### 1.6 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:**

**2.1 SPLIT-FACE CONCRETE MASONRY UNITS:**

A. Split-Face Concrete Block: Comply with referenced standards and as follows:
1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depth of 4 inches as manufactured by Nettleton Concrete, Inc., 2310 Moore Road Jonesboro, Arkansas 72401
2. Color - Olive Stone to match Split-Face Units on existing Allied Health Building.
3. Special Shapes: Provide non-standard blocks configured for corners.
4. Masonry Units: ASTM C 90. Net area compressive strength equal 1900 psi.
   a. Hollow block, as indicated.
   b. Type I: Moisture-controlled; lightweight.

**2.2 MORTAR AND GROUT MATERIALS:**

A. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample.
1. Hydrated Lime: ASTM C 207, Type S.
2. Grout Aggregate: ASTM C 404.

**2.3 REINFORCEMENT AND ANCHORAGE:**

A. Reinforcing Steel: ASTM A 615/A 615 M Grade 60 (420) deformed billet bars; galvanzied.

B. New unit masonry veneer to be seismically anchored using the "Seismiclip Interlock System" as manufacturered by Hohmann and Barnard, Inc. Hauppauge, N.U. 11788-4206.
1. Typical Sytem shall consist of:
   a. "X-Seal" S.I.S anchor system.
   b. "Seismiclip Interlock" System
   c. Continuous wire - 9 gage galvanized in conformance with ASTM A116 - Class 3 (0.8 oz zinc coating), ASTM A6141-Class 3 (0.8 oz zinc coating; as recommended by system manufacturer).
   d. Screws, anchors and accessories as recommended by system manufacturer.

C. Install Masonry Anchors at Concrete Footing Stem Walls per industry standard for condition.

**2.4 ACCESSORIES:**

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

**2.5 MORTAR AND GROUT MIXES:**

A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.

B. Grout: ASTM C 476. Consistency required to fill completely volumes indicated for grouting; fine

grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

## PART 3 - EXECUTION

### 3.1 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.

### 3.2 PREPARATION:

A. Direct and coordinate placement of metal anchors supplies for installation under other sections.

### 3.3 COURSING:

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
1. Bond: running.
2. Coursing: one unit and one mortar joint to equal 8 inches.
3. Mortar joints: concave.

### 3.4 PLACING AND BONDING:

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar as work progresses.

D. Interlock intersections and external corners, except for units laid in stack bond.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

### 3.5 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY:

A. Install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Lap joint reinforcement ends minimum 6 inches.

**3.6 GROUTED COMPONENTS:**

A. Lap splices minimum 24 bar diameters.

B. Support and secure reinforcing bars from displacement. Maintain position within ½ inch of dimensioned position.

C. Place and consolidate grout fill without displacing reinforcing.

**3.7 CONTROL AND EXPANSION JOINTS:**

A. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

**3.8 BUILT-IN WORK:**

A. As work progresses, install items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level and true to line.

**3.9 TOLERANCES:**

A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and ½ inch in 20 feet or more.

C. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; ½ inch in 30 feet.

D. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

**3.10 CUTTING AND FITTING:**

A. Cut and fit for infill. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

**3.11 CLEANING:**

A. Remove excess mortar and mortar smears as work progresses.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

**END OF SECTION**

**SECTION 05100**
**STRUCTURAL STEEL**

## PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. All work under this section is subject to the General Conditions and Supplementary General Conditions and shall be governed by the requirements therein.

1.2 SCOPE:

A. This section shall include the furnishing and erection of all structural steel. No structural steel members shall be cut or altered by any of the trades, without written permission from the Architect.

1.3 DISCRETIONARY STEEL ALLOWANCE:

A. This contractor shall provide a cash allowance of $1,000 for fabrication, re-fabrication and erection of steel. This is to be used at the discretion of the Architect and only with the Architect's written approval. This steel is not for Miscellaneous or Structural Steel detailed on plans. If any portion of this allowance is not used, the cost of which will be refunded to the Owner.

1.4 VERIFY DIMENSIONS:

A. General Contractor shall field verify existing dimensions prior to fabrication of structural steel.

1.5 SHOP DRAWINGS:

A. Steel fabricator shall submit five hard copies as per section 01300 of detailed and checked shop drawings for approval by the Architect. All drawings shall clearly show location and sizes of all material, all building dimensions and elevations pertinent to the structure, and any other miscellaneous technical and erection data required for approval and construction. These shop drawings must be approved by the Architect before fabrication and shipment. PARTIAL SUBMITTALS WILL NOT BE ACCEPTED UNLESS APPROVED IN ADVANCE WITH THE ARCHITECT.

1.6 INSPECTION OF FABRICATORS:

A. Approved fabricators are not required to have special inspections as required by Section 1704.2.5 of the IBC 2012 code.

B. Fabricators that are in good standing members of AISC are considered approved. Other fabricators not members of AISC shall submit the fabricator's written procedural and quality control manual and periodic auditing of fabrication practices to an approved special inspection agency for review prior the start of fabrication. This shall be at the fabricator's expense.

C. Approved fabricators shall submit a certification of compliance found in Section 01450 "Special Inspections" to the building official at the completion of fabrication.

D. All fabricators that not approved shall undergo special inspection as required by Section 1704.2.5 of the IBC 2012.

## PART 2 - MATERIALS

2.1 STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING:

A. Wide flange shapes and WT sections: High-Strength, Low-alloy, Columbium-Vanadium Steels of Structural Quality, ASTM A 992 Fy-50 ksi.

B. Angles, round bars, and channels: Specifications for Structural Steel, ASTM A36, Fy=36 ksi.

C. Plates less than ½" thick: ASTM A36, Fy=36 ksi.

D. Bars and Plates ½" Thick and Greater: ASTM A-572, Fy=50 ksi.

E. Steel pipe: Specification for Electric Resistance Welded Pipe ASTM A53, Grade B (Fy=35 ksi) or Specification for Hot-Formed Welded Seamless Carbon Steel Structural Tubing, ASTM A501 (Fy = 36ksi).

F. Steel tubing: Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes ASTM A500 (Fy = 46 ksi).

2.2 FASTENERS SHALL CONFORM TO THE FOLLOWING:

A. Arc-welding electrodes: American Welding Society "Specifications for Iron and Steel Arc-Welding Electrodes", latest addition, Type E70XX

B. Bolts
1. Bolts for wood blocking: Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, ASTM A307.
2. Bolts for main structural connections or bolts not otherwise specified:
   a. Specification for High Strength Bolts for Structural Steel Joints Including Suitable Nuts and Plain Hardened Washers, ASTM A325 Type N. Include suitable nuts and plain hardened washers, or
   b. Standard Specification Twist Off Type Tension Control Structural Bolt/Nut/Washer Assembly ASTM F-1852-08. 120/105 Min. tensile strength.
3. Anchor Bolts: ASTM A307.

C. Sleeve Anchors in Masonry: Federal Specifications A-A-1922A.

D. Expansion Anchors in Concrete:
1. In concrete: ICC-ES AC193. Acceptable anchors are Hilti KWIK Bolt-TZ (ICC-ESR-1917) or Simpson Strong-Bolt 2 (ICC-ES ESR-3037) or Powers Power-Stud+SD2 (ICC-ES-ESR 2502) or Powers Power Stud+SD1 (ICC-ES-ESR 2818)

E. Screw Anchors in Concrete:
1. In concrete: ICC-ES AC193. Acceptable anchors are Hilti KWIK HUS-EZ and KWIK HUS-EZ I (ICC-ESR-3027) or Simpson Titen HD and Titen HD Rod hanger (ICC-ESR-2713) or Powers Power Wedge Bolt+ (ICC-ES-ESR 2526)

F. Adhesive Anchors:
1. In concrete: ICC-ES AC308. Acceptable anchors are Hilti HIT-HY 200 SAFESet fast cure (ICC-ESR-3187), Hilti HIT-RE 500-SD slow cure (ICC-ESR-2322), Simpson SET-XP (ICC-ESR-2508), Simpson AT-XP (IAPMO UES-ER263), Powers Pure 110+ Epoxy System for standard cure (ICC-ES-ESR 3298) or Powers AC100+Gold+ Acrylic System for Fast cure (ICC-ES-ESR-2582) or approved equal. Steel anchor element shall be Hilti HAS-E, ASTM F1554 Grade 36, or ASTM A193, Grade B6, B8, or B8M continuously threaded rod.

G. Undercut Anchors:
1. In Concrete: ICC-ES AC193. Acceptable anchors are Hilti HDA (ICC-ESR-1546) or Simpson Torq-cut (ICC-ESR-2705) or Powers Atomic+ Undercut anchor (ICC-ES-ESR

3067).

2.3 CONNECTOR SHALL CONFORM TO THE FOLLOWING:

A. Headed Stud Shear Connectors: ASTM A108, Fy=51ksi, Fu=65 ksi minimum ultimate tensile strength. Studs shall be solid fluxed attached with appropriate stud gun capable of meeting the strengths set forth in Table 1.11.4 AISC Specification.

B. Headed Concrete Anchors: ASTM A108, Fy=49 ksi, Fu=65ksi minimum ultimate tensile strength.

C. Threaded Studs: ASTM A108, Fy=49ksi, Fu=61 ksi minimum ultimate tensile strength.

2.4 MECHANICAL EQUIPMENT FRAMES:

All mechanical equipment frames or miscellaneous steel required to complete the mechanical equipment installation shall be provided and detailed by the structural steel fabricator. The mechanical equipment contractor shall provide all necessary weights and dimensions to the structural steel fabricator. Shop drawings for mechanical and equipment frames must be submitted and accepted by the Architect.

2.5 FABRICATION:

A. Workmanship and fabrication shall be in accordance with AISC "Specification, Design, Fabrication and Erection of Structural Steel for Buildings" and with the following outline.

B. Welding shall be in accordance with the "Standard Code for Arc Welding in Building Construction" of the American Welding Society.

C. All structural steel shall be kept free of mud and dirt. Any dirty or muddy steel shall be washed clean.

D. Bearing surfaces shall be planed to true beds. Abutting surfaces shall be closely fitted.

E. All columns and bearing stiffeners shall be milled to give full bearing over the cross section. Column base plates 2" or less in thickness may be used without planing. It will not be necessary to plane bottom surfaces of plates or grout beds.

F. There shall be no splices (shop or field, bolted or welded) along structural steel members other than at locations shown on plans.

G. This Contractor shall be responsible for design and fabrication of all "simple framed" member connections unless detailed on plans. "Rigid framed" connections shall be fabricated as detailed on plans. Design and fabrication of connections shall meet the requirements of AISC Specifications.

H. Bolted connections shall meet AISC Specification for Structural Joints using ASTM A325 Type N; UNO on plans.

I. Fascia girders and other steel requiring accurate alignment shall be provided with slotted holes and/or washers for aligning the steel accurately.

2.6 PAINTING:

A. Deliver paint to shop and job in original sealed containers clearly marked with the manufacturer's name and identifying brand number or name. Use paint as prepared by the manufacturer without thinning or other admixture.

B. All structural steel shall be shop painted as follows:

1. Apply one coat of standard oxide primer (DFT = 3mil) to all surfaces of steel work.
2. Do not apply shop paint within 2" of surfaces to be field welded.
3. Do not apply shop paint to steel to be fire-proofed.
4. Exposed steel shall not have piece marks applied with bleed through type markers.

**PART 3 - EXECUTION**

3.1 ERECTION:

A. Erection shall include the setting of all columns and bases and erection of all structural steel as called for under the contract for furnishing and delivery of structural steel, but shall not include the setting of loose lintels (to be set by mason).

B. Set column bases and beam plates 12" x 12" and larger to accurate elevations approximately 1" clear of masonry on steel wedges and/or bolts as indicated on drawings. These will be grouted by the mason who will also set small beam plates. Wooden wedges shall not be used. Set anchor bolts to be concreted in by the mason.

C. See the drawings and general notes for field connections.

D. Field errors shall not be corrected by burning except with the permission of the Architect.

E. Brace and guy all structural members until all connections are made.

F. After erection, touch up all injuries to priming coat and all others where field welding is done. Bolt heads and nuts shall be touched up in field. Use same material as specified for shop coat.

3.2 WELDING:

A. Welding in shop and field shall be done by operators who have been previously qualified by tests as prescribed in the American Welding Society, "Standard Qualification Procedure." All operators must have successfully passed the welding qualification tests within a 24-month period preceding erection. The Architect shall be provided a copy of the welding qualification test for each operator at no additional cost to the Owner.

B. Equipment to be of a type which will produce proper current so that operator may produce satisfactory welds. Welding machine shall be of 200-400 ampere, 25-40 volt capacity.

C. Electrodes shall be suitable for positions and other conditions of intended use in accordance with the instructions with each container.

D. Field welding shall be done by direct current.

E. Technique of welding employed, the appearance and quality of welds made and methods of correcting defective work shall conform to American Welding Society "Code for Arc Welding in Building Construction", Section 4, "Workmanship".

F. Surfaces to be welded shall be free from loose scale, rust, grease, paint and other foreign material except that mill scale withstanding vigorous wire brushing may remain. A light film of linseed oil may likewise be disregarded. Joint surfaces shall be free from fins and tears.

G. No welding shall be performed when temperature of the base metal is lower than 0 degrees F. At temperatures between 32 degrees F. and 0 degrees F., the surfaces of all areas within 3" of a point where a weld is started shall be heated until they are too hot to touch before welding is started.

H. Finished members shall be true to line and free from twists, bends, and open joints.

3.3 QUALITY CONTROL OF WELDING:

A. All testing and visual inspection of welds shall be performed by a qualified welding inspector certified in accordance with the "American Welding Society (AWS) and the "American Society of Non-Destructive Testing (ASNT)".

B. Proper fit up and alignment of members shall be in accordance with AWS before welding is performed.

C. Visual Inspection
1. All field and shop full penetration welds specified in the contract documents shall be visually inspected. Welds not passing visual inspections shall be tested and included as part of percentage of welds required to be tested. If the amount of welds not passing visual inspection exceeds the percentage associated with the testing requirements, the contractor shall pay for the testing of welds exceeding the required percentage.
2. All fillet welds used in field connections of vertical lateral braces shall be visually inspected. Welds not passing inspection due to defects shall be tested and/or repaired at no cost to the owner. Welds not passing inspection due to inadequate size and length shall be repaired as required.

D. Testing Procedures
1. Full penetration welds: Radiographic, ASTM E94 or ultrasonic, ASTM E164 testing.
2. Fillet welds: Magnetic Particle testing
3. Headed Shear Studs: AS per AWS D1.1 Section 7

E. Testing Requirements

| Item Tested | | Percentage Tested |
|---|---|---|
| 1. | Full penetration welds for field beam to column connections. | 100% |
| 2. | Full penetration welds for field beam to beam connections. | 100% |

3.4 OBSERVATION:

A. The work shall be observed in the shop and the field. The Contractor shall give proper notice and allow full facilities for this observation. Notify Architect 48 hours prior to shipping structural steel.

**END OF SECTION**

# SECTION 05310
# STEEL ROOF DECK

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Steel roof deck and accessories.
2. Frames openings up to 10 inches by 10 inches.
3. Welding, fasteners, and accessories for attachment of deck.

B. Related Sections::
1. Structural Steel: Section 05100
2. Metal Fabrications: Section 05500

### 1.2 SUBMITTALS

A. Submit five copies for review of general conformance to design concept in accordance with Section 01300. Erection Drawings shall show type of deck, shop finish, accessories, method of attaching, edge details, deck openings and reinforcement, and sequence of installation.

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

### 1.3 QUALITY ASSURANCE

A. Metal deck shall be designed in accordance with the latest edition of the Steel Deck Institute's (SDI) - "Specifications and Commentary for Steel Roof Deck."

B. Welding operators shall be qualified in accordance with AWS Standard Qualification Procedures. Provide certification that welders employed in work have satisfactorily passed AWS qualification tests within previous 12 months. If recertification of welders is required, provide without additional cost to owner.

### 1.4 REFERENCE STANDARDS

A. AISI - "Specification for the Design of Cold-Formed Steel Structural Members."

B. ASTM A36 and A572 - Structural Steel.

C. ASTM A446 - Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process, Structural (Physical) Quality.

D. ASTM A525 - Steel Sheet, Zinc-Coated, Galvanized by the Hot-Dip Process.

E. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.

F. AWS D1.1 - Structural Welding Code.

G. AWS D1.3 - Specification for Welding Sheet Steel in Structures.

H. SDI - "Design Manual for Composite Decks, Form Decks and Roof Decks."

I. AISC - Manual of Steel Construction.

J. SDI - Diaphragm Design Manual.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials off ground with one end elevated on wood sleepers to provide drainage.

B. Prevent damage to edges, ends and surfaces.

C. Cut plastic wrap to encourage ventilation. Keep materials dry.

D. Separate sheets and store materials on dry wood sleepers off ground or concrete; slope for positive drainage

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS

A. Vulcraft A Division of Nucor Corporation.

2.2 MATERIALS

A. Sheet steel shall conform to ASTM A611 Grade C, D or E for prime painted decks or from ASTM A653-94 structural quality grade 33 or higher for galvanized decks and have a minimum yield strength of 33,000 PSI.

B. Bearing Plates and/or Angles shall be ASTM A572 steel.

C. Welding Methods and Materials shall conform to AWS D1.1 and AWS D1.3.

D. Steel Closure Strips, Ridge and Valley Plates, and Related Accessories shall be a minimum of 22 gage sheet steel of required profiles and sizes.

E. Finish:
Galvanizing shall conform to the requirements of ASTM A924-94 coating Class G60.
Shop Primer shall be acrylic medium gray.
Touch-up primer shall be compatible with manufacturer's primer.

F. Mechanical fasteners shall be Teks as manufactured by Builds, St. Charles Road, Elgin, Illinois, 60120. Selection of Teks fasteners not specified herein shall be in accordance with the manufacturer's recommendations.

G. Acoustical Insulation shall be glass fiber type with profile to suit decking and be supplied by the deck manufacturer.

2.3 FABRICATION

A. Steel deck shall have formed ribs of the type, finish, dimension and gage as shown on Drawings.

B. Fabricate deck in lengths to have three continuous spans or more whenever possible. Fabricate sheets to lap a minimum of 2" over supports at ends. Lap joints required where roof pitch changes due to the deck support elevations.

C. Design steel decking in accordance with SDI "Design Manual for Composite Decks, Form Decks, and Roof Decks." The maximum working stress shall not exceed 20,000 PSI. The maximum working stress shall in no case exceed the maximum yield strength of the steel divided by 1.65 but

may be increased by 33% for temporary concentrated loads provided the deck thus required is not less than that required for the specific uniform load. The deflection of the Deck under design live load shall not exceed 1/240 of the span. Minimum thickness of material supplied shall be within 5% of the design thickness.

D. Section properties used in determining stress and deflection shall be calculated in accordance with the latest edition of the Steel Deck Institute's "Design Manual for Floor Decks and Roof Decks."

E. Provide fabricate roof sump pan of 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, watertight. Typical at all roof drains.

F. Provide 6" closure strip where changes in deck direction occur. Closure shall be same gauge as deck.

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. On steel support members provide 1-1/2" minimum bearing. Align and level on supports.

B. Fasten steel deck units to structural supports using Hex washer head Teks or are spot welds according to manufacturers' specifications and direction layouts and as specified herein. Decks thinner than .0280 inches shall be welded using 16 ga. welding washers with a 3/8" diameter hole. Side lap connections shall be screwed.

C. Attach ridge and valley plates and steel cant strips directly to the steel deck where shown on the Drawings to provide a finished surface for the application of insulation and roofing.

D. Cutting of openings through the deck less than 16 square feet in area, and all skew cutting shall be performed in the field.

E. Arc spot welds (puddle welds) to supports shall have a diameter of 5/8" minimum, or an elongated weld of 3/8" minimum width and 3/4" minimum length. Weld metal shall penetrate all layers of deck material at end laps and have adequate fusion to the supporting members. Welding shall be done in accordance with the American Welding Society Standard "Specification for Welding Sheet Steel in Structures", AWS D1.3.

F. Fastening of deck to supports and side laps.
1. Deck ends at building perimeter: 6" o/c
2. Deck end laps: 6" o/c (min.)
3. Deck sides at building perimeter and deck side laps: Deck units with spans greater than five feet shall be fastened at midspan or at 36" intervals whichever is smaller.
4. See drawings for requirements beyond these minimum requirements.

G. At ends of decks or where changes of deck direction occur, fasten at each flute. Furnish and install adequate closures and fasten to both sides at 18" o.c.

H. Accessories shall be fastened to supports or deck with mechanical fasteners at not over 6" o.c. and at all corners and ends.

I. Position roof sump pans with flange bearing on top surface of deck. Screw at each deck flute.

3.2 CLEAN UP AND FINAL ADJUSTMENTS

A. Touch up surface coating damage and abrasions using a paint compatible with primer paint and/or

specially formulated for use with galvanized steel.

B. Installation holes shall be sealed with a closure plate 2 gauges thicker than deck and mechanically fastened to deck. Steel deck with holes visible from below will be rejected. Deck units that are bent, warped, or damaged in any way which would impair the strength and appearance of the deck shall be removed from site.

C. Steel decking work and accessories, when complete, shall be solid, smooth, and uniform in appearance.

D. Remove any unused steel deck, edge trimmings, screws, weld washers, butt ends of welding electrodes and other debris from completed installation.

**END OF SECTION**

**SECTION 05320**
**METAL FLOOR DECK**

## PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Applicable requirements of Conditions of Contract and General Requirements apply to Work specified in this Section.

B. Work included:
1. Provide steel form deck and accessories for forming of concrete floors.

C. Related work specified elsewhere:
1. Cast-In-Place-Concrete: Section 03300
2. Concrete Reinforcement: Section 03200
3. Structural Steel: Section 05100
4. Metal Fabrications: Section 05500 (Bearing plates and angles).

1.2 QUALITY ASSURANCE:

A. Steel deck shall be designed in accordance with the latest edition of the Steel Deck Institute's (SDI) "Specifications and Commentary for Non-Composite Steel Form Deck."

1.3 REFERENCE STANDARDS:

A. AISI - "Specification for the Design of Cold-Formed Steel Structural Members."

B. ASTM A572 - Structural Steel.

C. ASTM A924-94 - Steel Sheet, galvanized coating process Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. ASTM A653-94 Steel, cold-rolled sheet, carbon, structural quality.

E. ASTM A611 - Steel, Cold-Rolled Sheet, Carbon, Structural.

F. AWS D1.1 - Structural Welding Code.

G. AWS D1.3 - Specification for Welding Sheet Steel in Structures.

H. SDI - "Design Manual for Composite Decks, Form Decks, Roof Decks."

I. AISC - "Manual of Steel Construction."

J. SDI - Diaphragm Design Manual

1.4 SUBMITTALS:

A. Decking fabricator hall submit five hard as per section 01300 of checked shop drawings to the architect for review of general conformance to the design concept. Shop Drawings shall show type of deck, shop finish, accessories, method of attaching, edge details, deck openings and reinforcement, and sequence or installation.

1.5 STORAGE:

A. Store materials off ground with one end elevated on wood sleepers to provide drainage. Protect deck from elements with a waterproof covering and ventilate to avoid condensation.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS:

A. Vulcraft A Division of Nucor Corporation.

2.2 MATERIALS:

A. Sheet steel shall conform to ASTM A611 Grade C, D, or E or ASTM 653-94 for galvanized decks.
   1. Fluted Decks and Ribbed Steel Forms 1-1/2 inches or higher shall be formed from sheet steel having a minimum yield strength of 33,000 PSI.
   2. Ribbed Steel Forms less that 1-1/2 inches high shall be formed from sheet steel having a minimum yield strength of 80,000 PSI.

B. Bearing Plate and/or Angles shall be ASTM A572 steel.

C. Welding Methods and Materials shall conform to AWS D1.1 and AWS D1.3.

D. Metal Closure Strips, Wet Concrete Stops, Cover Plates and Related accessories shall be a minimum of 22 gage sheet steel of required profiles and sizes.

E. Finish:
   1. Galvanizing shall conform to the requirements of ASTM A924-94 coating class G60.
   2. Shop Primer shall be acrylic medium gray.
   3. Touch-up galvanizing with ZRC Galvitilite Galvanizing Repair Compound.

F. Mechanical fasteners shall be Teks as manufactured by Buildex, St. Charles Road, Elgin, Illinois 60120. Selection of Teks fasteners not specified herein shall be in accordance with the manufacturer's recommendations.

2.3 FABRICATION:

A. Steel Form Deck (metal centering) shall have formed ribs of the type, finish, dimension and gage shown on Drawings.

B. Deck shall be capable of supporting loads indicated on the Drawings. Structural capacity of deck sections shall be established from section properties computed in strict accordance with the latest edition of the Steel Deck Institute "Design Manual for Composite Decks, Form Decks and Roof Decks". The maximum working stress shall not exceed the yield strength divided by 1.65. Minimum thickness of material supplied shall be within 5% of design thickness.

C. Fabricate deck in lengths to have three continuous spans or more whenever possible. Fabricate Steel Deck and Ribbed Metal Forms to lap a minimum of 2" over supports at ends.

D. Bearing lengths shall be established in accordance with the latest edition of the Steel Deck Institute's "Design Manual for Composite Decks, Form Decks and Roof Decks and shall be consistent with the deck capacity established in paragraph 2.03 B.

**PART 3 - EXECUTION**

3.1 INSTALLATION:

A. Deck and accessories shall be installed in accordance with the manufacturer's shop and erection drawings. Minimum bearing shall not be less than 1-1/2" inches.

B. Fasten steel deck units to structural supports using Hex washer head Teks or arc spot welds according to manufacturer's specifications and erection layouts and as specified herein. Decks thinner than .0280 inches shall be welded using 16 ga. welding washers with a 3/8" diameter hole. Side lap connections shall be screwed.

C. Arc spot welds (puddle welds) to support shall have a diameter (weld nugget) of 3/8" minimum. Weld metal shall penetrate all layers of deck material at end laps and have adequate fusion to the supporting members. Welding shall be done in accordance with the American Welding Society Standard "Specification for Welding Sheet Steel in Structures", AWS D1.3.

D. Fastening of deck to supports and side laps.
1. Deck ends at building perimeter: 6" o/c
2. Deck end laps: 6" o/c (36/4 min.)
3. Deck sides at building perimeter and deck side laps: Deck units with spans greater than four feet shall be fastened at midspan or at 24" intervals whichever is smaller.
4. See drawings for requirements beyond these minimum requirements.

E. At ends of decks or where changes of deck direction occur, fasten at 6" o.c. Furnish and install adequate closures and fasten to both sides at 6" o.c.

F. Cutting openings through the deck less than 16 square feet in area, and all skew cutting shall be performed in the field.

G. Install sheet steel strip closures at all floor edge upturned to thickness of slab to contain wet concrete. Provide closures of sufficient strength to remain in place without distortion.

H. Install sheet closures and angle flashings to close openings between deck and walls, column, and openings.

I. Accessories shall be fastened to supports or deck with mechanical fasteners at not over 12" o.c. and at all corners and ends.

J. Concentrated loads and impact loads during erection and construction shall be avoided. Before the slab is poured, form deck shall be planked in all traffic areas to prevent damage to units.

3.2 CLEAN UP AND FINAL ADJUSTMENTS:

A. Touch up surface coating damage and abrasions using a paint specially formulated for use with galvanized steel. For painted deck use paint compatible with manufacturer's primer.

B. Installation holes shall be sealed with a closure plate 2 gages thicker than deck and mechanically fastened to deck. Steel deck with holes visible from below will be rejected. Deck units that are bent, warped, or damaged in any way which would impair the strength and appearance of the deck shall be removed from site.

C. Steel decking work and accessories, when complete, shall be solid, smooth, and uniform in appearance.

D. Remove any unused steel deck, edge trimmings, screws, weld washers, butt ends of welding electrodes, and other debris from completed installation.

**END OF SECTION**

SECTION 05330
COMPOSITE STEEL DECK

## PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Applicable requirements of Conditions of Contract and General Requirements apply to Work specified in this Section.

B. Work included:
1. Provide composite steel deck and accessories for forming of concrete floors.

C. Related work specified elsewhere:
1. Cast-In-Place Concrete: Section 03300
2. Concrete Reinforcement: Section 03200
3. Concrete Formwork: Section 03100
4. Structural Steel: Section 05100
5. Steel Joists: Section 05200
6. Metal Floor Deck: Section 05320
7. Metal Fabrications: Section 05500 (Bearing plates and angles).

1.2 QUALITY ASSURANCE:

A. Composite steel deck shall be designed in accordance with the latest edition of the Steel Deck Institute's (SDI) "Specifications and Commentary for Composite Steel Floor Deck."

1.3 REFERENCE STANDARDS:

A. AISI - "Specification for the Design of Cold-Formed Steel Structural Members."

B. ASTM A653-94 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.

C. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

D. AWS D1.1 - Structural Welding Code.

E. AWS D1.3 - Specification for Welding Sheet Steel in Structures.

F. SDI - "Design Manual for Composite Decks, Form Decks, Roof Decks."

G. AISC - "Manual of Steel Construction."

H. ASCE - "Specifications for the Design and Construction of Composite Slabs and Commentary on Specifications for the Design and Construction of Composite Slabs."

I. SDI - Diaphragm Design Manual.

1.4 SUBMITTALS:

A. Decking fabricator shall submit one hard copy (not to be returned) and one electronic copy in PDF format as per section 01340 of checked shop drawings to the architect for review of general conformance to the design concept. Shop Drawings shall show type of deck, shop finish, accessories, method of attaching, edge details, deck openings and reinforcement, and sequence of installation.

1.5 STORAGE:

A. Store materials off ground with one end elevated on wood sleepers to provide drainage. Protect deck from elements with a waterproof covering and ventilate to avoid condensation.

**PART 2 - PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS:

A. Vulcraft A Division of Nucor Corporation.

2.2 MATERIALS:

A. Composite steel floor deck shall be fabricated from steel sheet conforming to ASTM A611 Grades C and D or A653-94 (or equal) having a minimum yield strength of 40 KSI.

B. Bearing Plate and/or Angles refer to Section 5500.

C. Welding Methods and Materials shall conform to AWS D1.1 and AWS D1.3.

D. Steel Closure Strips, Wet Concrete Stops, Multiple Cell Headers, Cover Plates and Related Accessories shall be a minimum of 22 gage sheet steel of required profiles and sizes.

E. Finish:

1. The finish, as shown on the plans, is to be:
   a. Galvanizing shall conform to the requirements of ASTM A653-94 coating class G60.
   b. Phosphatized and painted over cleaned steel with the exposed side only painted. The side in contact with the concrete is to be phosphatized only. Paint is to be a baked-on acrylic primer.
   c. If fireproofing is to be applied the paint shall be compatible with fireproofing materials.
   d. Touch-up primer shall be compatible with manufacturer's primer.

F. Mechanical fasteners shall be Teks as manufactured by Buildex, St. Charles Road, Elgin Illinois, 60120. Selection of Teks fasteners not specified herein shall be in accordance with the manufacturer's recommendations.

G. The deck manufacturer shall have performed or have witnessed by a Registered Engineer, a sufficient number of tests on the composite deck/slab system to have determined load/deflection characteristics and the mode of failure under uniform or symmetrically placed point loads. Based on the test data the design load capacity shall be established by either elastic flexural analysis or ultimate strength analysis based on shear bond failure or flexural failure.

2.3 FABRICATION:

A. Steel Deck shall have formed ribs of the type, finish, dimension and gage shown on Drawings.

B. Cellular Steel Deck units shall be a minimum of ___ inches wide and __ inches high. The top sheet shall be a fluted profile of ___ gage. The bottom sheet shall be flat of ___ gage. Both sheets shall be formed from galvanized sheet steel. The cellular units shall conform to U.L. Assembly No. ___.

C. The Composite Steel deck units shall serve as a form, total positive reinforcement, and partial temperature reinforcement for the concrete slab.

D. Deck shall be capable of supporting uniform design loads as indicated on the Drawings. Structural capacity of deck sections shall be established from section properties computed in strict accordance with the latest edition of the "Steel Deck Institute Design Manual". The maximum working stress shall not exceed the yield strength divided by 1.65. Minimum thickness of material supplied shall be within 5% of design thickness. The deflection of the deck under design live load shall not exceed 1/360 of the span.

E. Fabricate deck in lengths to have three continuous spans or more whenever possible. Fabricate Deck to butt ends allowing for a maximum of 1/8" gap.

F. Bearing lengths shall be established in accordance with the latest edition of the Steel Deck Institute's "Design Manual for Composite Decks, Form Decks and Roof Decks and shall be consistent with the deck capacity established in paragraph 2.3.4.

**PART 3 - EXECUTION**

3.1 INSTALLATION:

A. Deck and accessories shall be installed in accordance with the manufacturer's shop and erection drawings. Minimum bearing shall not be less than 1-1/2 inches.

B. Fasten steel deck units to structural supports using Hex washer head Teks or arc spot welds according to manufacturer's specifications and erection layouts and as specified herein. Side lap connections shall be screwed or button punched depending on deck profile.

C. Level and align cellular deck intended for electrical raceways and mechanical piping within 1/8 inch horizontally and vertically. Butt ends, allow for maximum 1/8 inch gap. Install sheet steel covers over gaps wider than 1/8 inch. Tape seal joints watertight.

D. Arc spot welds (puddle welds) to support shall have a diameter (weld nugget) of 5/8" minimum. Weld metal shall penetrate all layers of deck material at end laps and have adequate fusion to the supporting members. Welding shall be done in accordance with the American Welding Society Standard "Specification for Welding Sheet Steel in Structures", AWS D1.3.

E. Fastening of deck to supports and side laps.
1. Deck ends at building perimeter: 12" o/c (36/4 min.)
2. Deck end laps: 12" o/c (36/4 min.)
3. Deck sides at building perimeter and deck side laps: Deck units with spans greater than five feet shall be fastened at midspan or at 36" intervals whichever is smaller.
4. See drawings for requirements beyond these minimum requirements.

F. At ends of decks or where changes of deck direction occur, fasten at 18" o.c. Furnish and install adequate closures and fasten to both sides at 18" o.c.

G. Cutting of openings through the deck less than 16 square feet in area, and all skew cutting shall be performed in the field.

H. Install sheet steel strip closures at all floor edge upturned to thickness of slab to contain wet concrete. Provide closures of sufficient strength to remain in place during concrete placement without distortion.

I. Install sheet closures and angles flashing to close openings between deck and walls, columns, and openings.

J. Accessories shall be fastened to supports or deck with mechanical fasteners per manufacturer's recommendations.

3.2 CONSTRUCTION LOADS:

A. Composite steel floor deck units shall serve as a form to support the slab weight and construction loading of 20 psf uniform load.

B. If heavier construction loads are required, allowable unshored spans shall be reduced accordingly by installation of temporary shoring.

C. When required, composite steel floor deck units shall be temporarily shored in accordance with the deck manufacturers Shoring Tables. Shoring shall be designed in accordance with applicable local and state building code regulations. Shoring shall remain in place until the concrete flooring attains a minimum of 75% of the concrete design compressive strength and removal is subject to the approval of the Engineer.

D. Concentrated loads and impact loads during erection and construction shall be avoided. Before the slab is poured, form deck shall be planked in all areas to prevent damage to units.

3.3 CLEAN UP AND FINAL ADJUSTMENTS:

A. Touch up surface coating damage and abrasions using a paint specially formulated for use with galvanized steel. For painted deck use paint compatible with manufacturer's primer.

B. Installation holes shall be sealed with a closure plate 2 gages thicker than deck and mechanically fastened to deck. Steel deck with holes visible from below will be rejected or sealed. Deck units that are bent, warped, or damaged which would impair the strength and appearance of the deck shall be removed from site.

C. Steel decking work and accessories, when complete, shall be solid, smooth, and uniform in appearance.

D. Remove any unused steel deck, edge trimmings, screws, weld washers, butt ends of welding electrodes, and other debris from completed installation.

**END OF SECTION**

# SECTION 05400
# LIGHTGAGE METAL FRAMING

## PART 1 - GENERAL

1.1 SCOPE:

A. All axial or wind loaded light gage steel studs, track, joists, bridging and related accessories are as indicated on the Contract Drawings and specified herein.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS:

A. Structural Steel: Section 05100

B. Gypsum Wallboard: Section 09250

1.3 QUALITY ASSURANCE:

A. Qualifications of manufacturer: products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable by the Architect.

B. Inspection and Quality Control;
1. Contractor shall provide effective full time quality control over all fabrication and erection activities.
2. As directed by Architect, owner's testing agency may inspect the maintenance of a quality control program including spot checking weldments and welding procedures in accordance with A.W.S. standards.
3. Inspection responsibility for quality control shall remain with contractor.

C. Standards
1. Work shall meet the requirements of the following standards.
   a. American Iron and Steel Institute (A.I.S.I.) "Design of Cold Formed Steel Structural Members," 1986 with 1989 amendments.
   b. American Welding Society (A.W.S.) D.1.3, 1981 "Structural Welding Code-Sheet Steel".
   c. American Society for Testing and Materials (A.S.T.M.)
   d. American Institute of Steel Construction (A.I.S.C.) "Manual of Steel Construction," 9th edition.
   e. 2012 International Building Code with Arkansas Amendments.
2. The most stringent requirements shall govern in conflicts between specified codes and standards.

1.4 SUBMITTALS

A. General: Submit five hard copies as per section 01300 of fabrication and erection shop drawings and product data to the architect for approval.

B. Product Data: Submit copy of installation instructions for each item of lightgage framing and accessories.

C. Shop Drawings: Drawings shall show framing member indicating size and gage designations, number, type, location and spacing. Indicate supplemental bracing, accessories, and details as may be required for proper installation.

1.5 PRODUCT DELIVERY AND STORAGE:

A. Protect metal framing units from rusting and damage. Deliver to the project site in manufacturer's unopened containers or bundles, fully identified with name, brand, type, location and spacing. Indicate supplemental bracing, accessories, and details as may be required for proper installation.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS:

A. Clark Dietrich Building Systems, Marino, or approved equal.

2.2 METAL FRAMING

A. Systems Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as indicated and as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.

B. Material and Finishes:
1. All galvanized studs and joists shall be formed from steel that corresponds to the minimum requirements of 1986 A.I.S.I. standards with 1989 amendments.
2. All galvanized studs, joists, track, bridging and accessories shall be formed from steel having a galvanized coating meeting the requirements of ASTM A653.
3. Structural studs, joists, track, shall be color coded for appropriate material thickness. A sign shall be posted adjacent to material stockpile clearly depicting which color corresponds to the material thickness. All studs, joists, track, etc. shall be stamped by manufacturer with size.
4. Lightgage framing materials 54 mil. (16 gage) and thicker shall have a yield stress Fy=50 ksi. All lightgage framing materials 43 mil. (18 gage) and lighter shall have a yield stress Fy=33 ksi.
5. Minimum stud size for exterior walls, 600S162 43 mil.
6. Track sizes gage to match stud sizes and gage.
7. Structural lightgage members shown on drawings are called out based on industry standard nomenclature.
8. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.
9. Electrodes for welding: Comply with AWS Code and as recommended by stud manufacturer.
10. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A 780.

C. Vertically adjusting tracks connecting studs to structural steel or deck are "Verti Track" by The Steel Network, Inc. 3221 Wellington Ct., Raleigh, NC or approved equal.

2.3 FABRICATION:

A. General:
1. Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members in the assembly.
2. Fabricate units in jig templates to hold members in proper alignment and position and to assure consistent component placement.
3. Splices in axially loaded studs shall not be permitted.

B. Fastenings.

1. Attach similar components by self-drilling screws or welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with the manufacturer.
2. Wire taping of framing components is not permitted.
3. Welds shall be performed by operators qualified in accordance with section 6.0 of the American Welding Society's "Structural Welding Code-Sheet Metal" (AWS D1.3-81). All welds shall be touched up with zinc rich paint.

C. Fabrication Tolerances:
1. Fabricate units to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8" in 10'.
2. Axially loaded studs shall have full bearing inside track web (1/16" max. gap), prior to stud and track attachment. Studs shall be ordered long and cut in the field. Stud lengths are to be determined using laser equipment.

**PART 3 - EXECUTION**

3.1 INSTALLATION: Install metal framing systems in accordance with manufacturers printed or written instructions and recommendations, and final shop drawings.

A. Runner tracks: Install continuous tracks sized to match studs. Align tracks accurately to the layout at base and top of studs. Secure tracks as recommended by the stud manufacturer for the type of construction involved, except do not exceed 16" o.c. spacing for nail or power-driven fasteners, nor 12" o.c. for the other types of attachment. Provide fasteners at corners and ends of tracks.

B. Fasteners: (Unless noted otherwise on drawings).
1. Light gage metal to light gage metal: Kwik-Pro Self Drilling by Hilti. No 8-18 PPH for 18 gage metal. No. 10-16 PPH for 16 gage, 14 gage and 12 gage. Minimum of two screws per connection.
2. Light gage metal to steel. Kwik-Pro Self Drilling by Hilti. No. 12-24 HWH. Drill through light gage into steel, 16" o.c. maximum spacing.
3. Light gage to Concrete: DX Powder Actuated Fastener by Hilti. DX Fastener X-DNI Domed Head Nail .145 inch and minimum penetration of 1 1/8 inch. 16" o.c. maximum spacing.
4. Wood to light gage: Minimum of No. 8x1 inch bugle head screws.

C. WALL STUDS: Space studs 16" o.c.
1. Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
2. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements. Provide minimum of 10" from end of stud to start of first punchcut at top and bottom.
3. Where stud system abuts structural columns or walls, anchor ends or stiffeners to supporting structure.
4. Install supplementary framing, blocking and bracing in the metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards in each case, considering the weight or loading resulting from the items supported.
5. Frame wall openings larger than 2' square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure studs system wall opening frame in manner indicated.

6. Frame both sides of expansion and control joints, as shown for the wall system, with a separate stud; do not bridge the joint with components of the stud system.
7. Install horizontal bridging of 54 mil. "U" channel in stud system, spaced (vertical distance) at not more than 4 ft o.c.
8. Temporary bracing shall be provided until erection is completed.

D. HEADERS: Locate in elevation and horizontal spacing as shown on plans.
1. Punchouts in webs of headers shall be placed a minimum of 10" clear from the face of the supporting wall.
2. Provide blocking and strapping per drawing.

E. ERECTION TOLERANCES:
1. Bolt or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.
2. Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16".

3.2 FIELD PAINTING:

A. Touch-up shop-applied protective coating damaged during handling and installation. Use galvanizing repair paint for galvanized surfaces.

**END OF SECTION**

# SECTION 05500
# METAL FABRICATIONS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Steel Bollards

C. Misc. shop fabricated steel items.

### 1.2 REFERENCES:

A. ASTM A 53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 1997

### 1.3 SUBMITTALS:

A. See Section 01300 - 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.

## PART 2 - PRODUCTS

### 2.1 MATERIALS - STEEL:

A. Pipe: ASTM A 53, Grade B, Schedule 40, black finish. See Civil Drawings

B. Shop and Touch-Up Primer: SSPC - Paint 15, Type I - Red Oxide.

### 2.2 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. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### 2.3 FABRICATED ITEMS:

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish

### 2.4 FINISHES - STEEL:

A. Prime paint all steel items

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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

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

### 3.2 PREPARATION:

A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.

### 3.3 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. Obtain approval prior to site cutting or making adjustments not scheduled.

### 3.4 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 05513
# METAL STAIRS AND LADDERS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:
A. Aluminum fixed vertical ladders.

### 1.2 RELATED SECTIONS:
A. Section 05100 - Structural Steel: Roof structure and opening support; Roof framing and support.
B. Section 05550 - Metal Fabrications: Miscellaneous metal supports.
C. Section 06114 – Wood Blocking / Curbing: Roof framing and opening support.
D. Section 07551 – Modified Bitumen Roofing.
E. Section 07723 – Roof Hatch and Ladder Safety Post

### 1.3 REFERENCES:
A. ANSI A14.3: Ladders - Fixed - Safety Requirements.
B. OSHA 1910.27: Fixed Ladders.

### 1.4 SUBMITTALS:
A. Submit under provisions of Section 01300.
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 for Ladders:
   1. Plan and section of ladder installation.

### 1.5 DELIVERY, STORAGE, AND HANDLING:
A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store products until installation inside under cover. If stored outside, under a tarp or suitable cover.

### 1.6 WARRANTY:
A. Limited Warranty: Five years against defective material and workmanship, covering parts only, no labor or freight. Defective parts, if deemed so by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant which warrants same.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER:
Acceptable Manufacturer: Precision Ladders, LLC, which is located at: P. O. Box 2279 ; Morristown, TN 37816-2279; Toll Free Tel: 800-225-7814; Tel: 423-586-2265; Email: info@PrecisionLadders.com; Web: www.PrecisionLadders.com

### 2.2 ALUMINUM FIXED VERTICAL LADDER:
A. Aluminum Fixed Vertical Ladder and Components: Ladder, wall and floor mounting brackets, security door, and safety caps.

1. Model: Model FL -204 (field verify vertical height in inches prior to manufacturing. Coordinate with Roof Hatch height) Aluminum Fixed Vertical Ladder as manufactured by Precision Ladders LLC.
2. Capacity: Unit shall support a 1500 lb (680 kg) loading without failure, and individual treads shall withstand a 3,000 lb (1361 kg) loading without failure.
3. Performance Standard: Units designed and manufactured to meet or exceed ANSI A14.3 and OSHA 1910.27.

B. Components:

1. Ladder Stringer: 2-1/2 inch by 1-1/16 inch by 1/8 inch (64 mm by 27 mm by 3 mm) extruded 6005-T5 aluminum channel. Pitch: 90 degrees.
2. Ladder Tread: 2-1/4 inch by 3/4 inch by 1/4 inch (57 mm by 19 mm by 6 mm) extruded 6005-T5 aluminum with deeply serrated top surface.
3. Ladder Mounting Bracket: 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick (216 mm by 51 mm by 76 mm by 6 mm) aluminum angle.
4. Security Door: 0.125 inch (3 mm) 3003-H14 aluminum panel 84 inches (2134 mm) tall with padlock provision.
5. Floor Brackets: Floor bracket at foot of each stringer, 3 by 2 by 1/4 inch (76 by 51 by 6 mm).
6. Safety Caps: 0.125 inch (3mm) molded polyurethane safety caps.
7. Finishes:
   a. Standard: Mill finish on aluminum ladder components.

**2.3 FABRICATION:**

A. Completely fabricate ladder ready for installation before shipment to the site.

B. Completely fabricate handrail components and ship to site ready for field assembly and attachment to ladder.

## PART 3 - EXECUTION

**3.1 EXAMINATION:**

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

B. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

**3.2 INSTALLATION:**

A. Install in accordance with manufacturer's instructions.

B. Provide and install bracing/blocking in walls as required for support of ladder.

C. Coordinate with Roof Hatch installation.

**3.3 PROTECTION:**

A. Protect installed products until completion of project.

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

END OF SECTION

# SECTION 05521
# MEZZANINE GUARD RAILS / GATES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Permanent railing system for mezzanine edge fall protection.

### 1.2 RELATED SECTIONS:

A. Section 03300 - Cast in Place Concrete

B. Section 05100 - Structural Steel

### 1.3 REFERENCES:

A. 2012 Arkansas Fire Prevention Code (based on IBC 2012 Edition with Arkansas Amendments)

B. Americans with Disabilities Act Accessibility Guidelines (ADAAG) - latest edition

C. Occupational Safety & Health Administration (OSHA):
   1. 29 CFR 1910.23 - Guarding floor and Wall Openings and Holes.
   2. 29 CFR 1926.501 - Duty to Have Fall Protection
   3. 29 CFR 1926.502 - Fall Protection Systems Criteria and Practice.

### 1.4 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. 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: Drawings showing plans, elevations, sections and details of components.

### 1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to the job site in good condition and adequately protected against damage as handrails are a finished product.

B. Inspect rail sections for damage before signing the receipt from the trucking company. Truck driver must note damaged goods on the bill of lading if damaged product is found.

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

### 1.6 PROJECT CONDITIONS:

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication.

### 1.7 WARRANTY:

A. Warranty: Provide manufacturer's two (2) year warranty.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Wildeck, Inc.

B. Safety Rail Company, LLC

C. Wirecrafters (Kentucky)

D. Cogan (Canada)

E. Substitutions: Per provisions of Section 01600.

### 2.2 SYSTEMS:

A. Provide permanent mezzanine barrier system, including railings, mounts, connectors and sliding gates with padlock hasps.
   1. Standards: System shall be a "3-rail" design with top, 2 mid rails, and meet OSHA Standards 29 CFR 1910.23 (a) (2).
   2. Structural Load: 200 lb, minimum, in any direction to all components in accordance with OSHA Regulation 29 CFR 1926.502.
   3. Rail system to cmply with ADAAG guidelines.
   4. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
   5. Height: 42 inches nominal.
   6. Railings: 1-5/8" O.D. hot rolled pickled electric weld tubing, free of sharp edges and snag points.
   7. Mounting bases: Permanent Mount Brackets to concrete floor or structural steel.
   8. Hardware: Securing tamper proof 3/8 bolts, 1010 carbon steel, zinc plated or equal.
   9. Accessories: toe Board Brackets.
   10. Rail system to include toe kickplate.
   11. Sliding gate design to include protection for wheels.
   12. All steel components to be prime painted and sealed in a powder-coated safety yellow paint finish.
   13. Manufacturer must provide steel mill and foundry certificates for verification upon request.
   14. Quality/Standards Certifications: Manufacturer must be American Welding Society welding qualified for Welding Standards AWS D1.1 & AWS D1.3 Third party qualification documentation required prior to shipment.

B. Mezzanine Safety Rail System: Configurations to be as indicated by project drawings. Submit layout for approval.

### 2.3 FINISHES:

A. Finish: Hot Dipped Zinc Galvanized.

B. Color: Safety Yellow; Verify color with Architect..

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

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

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

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

**3.2 PREPARATION:**

A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete.

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

**3.3 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. Obtain approval prior to site cutting or making adjustments not scheduled.

D. Install in accordance with manufacturer's instructions.

**3.4 PROTECTION:**

A. Protect installed products until completion of project.

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

**END OF SECTION**

# SECTION 05750
# PERFORATED METAL PANELS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Perforated metals panels for use on millwork and suspended ceiling.

B. Uni-struts, stand-off mounts and accessories as required for installation

### 1.2 RELATED SECTIONS:

A. Section 06410 - Custom Cabinets: Lobby reception desk

### 1.3 REFERENCES:

A. ASTM A1008 - Offers closer size tolerance, broader range of sizes and better surface than pickled and oiled. Smooth dull surface is ideal for paints, enamels, lacquers and it can be electroplated. It is soft enough to bend flat on itself without cracking and ductile enough for many drawing applications. Available 7 to 28 gauge.

### 1.4 SUBMITTALS:

A. See Section 01300 - 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.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER - STEEL PANELS:

A. McNichols Co., 1-800-237-3820; www.mcnichols.com

### 2.2 MATERIALS - GALVANIZED STEEL PANELS:

A. Round Perforated, 18 gauge galvanized ½" round on 11/16" staggered, 48" x 96" for ceiling installation; sizes as required for millwork.
   1. McNichols product #1412611848
   2. All panels to have U-edging. U-shaped products designed to be cut to size and fit over a rough edge of a sheet good to provide protection and appearance value.

B. Uni-struts for hanging perforated panels from ceiling. Anchor as required to structure.

C. Stainless steel stand-off hardware to mount panels on millwork. Submitted for approval

### 2.3 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. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

**2.4 FINISHES:**

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing. Surfaces of panels used on millwork to have no burrs that can cause snagging

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

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

**3.2 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. Obtain approval prior to site cutting or making adjustments not scheduled.

**END OF SECTION**

# SECTION 05810
# EXPANSION JOINT COVER ASSEMBLIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Expansion joint cover assemblies for floor, wall, ceiling and soffit surfaces.

### 1.2 REFERENCES:

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Roads, Wire, Profiles, and Tubes; 1996.

B. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Roads, Wire, Profiles, and Tubes; (Metric) 1996.

C. ASTM B 308/B 303M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 1996.

D. ASTM B 455 - Standard Specification for Copper-Zinc-Lead Alloy (Leaded Brass) Extruded Shapes; 1996.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals for submittal procedures.

B. Product Data; Provide joint assembly profiles, profiles dimensions, anchorage devices, available color and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction, anchorage locations.

D. Samples: Submit two samples, approximately 6 inches long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

### 1.4 QUALITY ASSURANCE:

A. Field measurements: Verify compliance with manufacturer's requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Expansion Joint Cover Assemblies:
   1. C/S (Construction Specialities) Group expansion Joint Covers.
   2. Schluter Systems
   3. Substitutions: See Section 01600 - Product Requirements.

### 2.2 MATERIALS:

A. Joint Covers: Aluminum cover plate, aluminum frame construction, retainers with resilient

elastomeric filler strip, designed to permit plus or minus 50 percent joint movement with full recover, flush mounted.

B. Back paint components in contact with cementitious materials.

C. Galvanized embedded ferrous metal anchors and fastening devices.

D. Shop assemble components and package with anchors and fittings.

E. Provide joint components in single length wherever practical. Minimize site splicing.

**2.3 FINISHES:**

A. Floors: Mill Finish.

B. Walls and Ceilings: Clear anodized.

C. Resilient Filler exposed to View: Gray.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify that joint preparation and affected dimensions are acceptable.

**3.2 PREPARATION:**

A. Provide anchoring devices for installation and embedding under Section 03100.
1. Provide templates and rough-in measurements.

**3.3 INSTALLATION:**

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

**3.4 PROTECTION OF FINISHED WORK:**

A. Do not permit traffic over unprotected floor joint surfaces.

**3.5 SCHEDULE:**

A. Wall Joints at Gypsum Board on Studding, Recess Mounted.
1. C/S Group - Model FWF-200

B. Ceiling Joints at Suspended Acoustic Ceiling Finish
1. C/S Group - Model FCF-200

C. Ceiling Joints at Gypsum Board Ceiling Finish.
1. C/S Group - Model FCF-200

**END OF SECTION**

# SECTION 06114
# WOOD BLOCKING AND CURBING

## PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Blocking in wall openings.

B. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, markerboards, fire extinguishers cabinets and other wall mounted equipment.

1.2 REFERENCES:

A. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties – Preservative Treatment by Pressure processes; American Wood - Preservers' Association; 1997.

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

C. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1994.

1.3 QUALITY ASSURANCE:

A. Lumber: Comply with ALSC and approved grading rules and inspection agencies.

B. Plywood: Comply with APA.

## PART 2 - PRODUCTS

2.1 DIMENSION LUMBER:

A. Lumber Grading Rules: NFPA.

B. Miscellaneous Blocking, Furring and Nailers:
1. SYP species.

2.2 CONSTRUCTION PANELS:

A. Plywood Sheathing: SP 1, Grade C-D, Exposure I.

B. Miscellaneous Panels:
1. Concealed Plywood: PS 1, C-C plugged, exterior grade.
2. Exposed Plywood: PS 1, A-D, interior grade.
3. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

2.3 ACCESSORIES:

A. Fasteners and Anchors:
1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Anchors: Toggle bolt type for anchorage to hollow masonry; expansion shield and lag bolt type for anchorage to solid masonry or concrete; bolt or ballistic fastener for anchorages to steel.

2.4 FACTORY WOOD TREATMENT:

A. Pressure Treatment of Lumber Above Grade: AWPA Treatment C2 using waterborne preservative to 0.25 lb/cu ft. retention.
1. Kiln dry after treatment to maximum moisture content of 19 percent.

**PART 3 - EXECUTION**

3.1 FRAMING INSTALLATION:

A. Set members level and plumb, in correct position.

B. Place horizontal members with crown side up.

C. Provide miscellaneous members as indicated or as required to support finishes, fixtures, and specialty items.

3.2 SCHEDULES:

A. Telephone and Electrical Panel Boards: 1/4 inch thick, plywood or particleboard, fire retardant treated.

**END OF SECTION**

# SECTION 06200
# FINISH CARPENTRY

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Work described in this section:
   1. Finish carpentry items.
   2. Plastic Laminate.
   3. Hardware and attachment accessories.
   4. Window sills.

B. Related work specified elsewhere:
   1. Section 09900 - Paint and Coatings

### 1.2 REFERENCES:

A. AHA A135.4 - Basic Hardboard; American Hardboard Association; 1995.

B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1999.

C. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 1994.

E. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 1999.

F. WIC (MAN) - Manual of Millwork; Woodwork Institute of California; 1998.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

### 1.4 QUALITY ASSURANCE:

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, custom grade.

### 1.5 REGULATORY REQUIREMENTS:

A. Conform to applicable code for fire retardant requirements.

**1.6 DELIVERY, STORAGE AND PROTECTION:**

A. Protect work from moisture damage.

**1.7 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**

**2.1 LUMBER MATERIALS:**

A. Plywood Sheathing: SP 1, Grade C-D, Exposure I.

B. Miscellaneous Panels:
1. Concealed Plywood: PS 1, C-C plugged, exterior grade.
2. Exposed Plywood: PS 1, A-D, interior grade.
3. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

**2.2 SHEET MATERIALS:**

A. Softwood Plywood: PS 1; Standard Sheathing grade, Group 1, 2, 3, 4, appearance quality; species with face veneer of rotary cut grain, of quality capable fo transparent or painted finish as scheduled.

B. Hardwood Plywood: ANSI/HPHA HP; Premium grade in accordance with AWI; veneer lumber particleboard core material; oak species with face veneer of plain sliced vertical mixed flat grain of quality capable of transparent finish.

**2.3 PLASTIC LAMINATE MATERIALS:**

A. Plastic Laminate: 0.625 inch general purpose grade; color as selected. See Specification Section 00860 - Color Schedule. Grade as required for curved front of reception desk.

**2.4 SOLID SURFACING:**

A. See Section 06650 - Solid Surfacing.

**2.5 ADHESIVE:**

A. Plastic Laminate Adhesive: type recommended by laminate manufacturer to suit application..

**2.6 FASTENERS:**

A. Fasteners: of size and type to suit application and per manufacturer's recommendations.

**2.7 ACCESSORIES:**

A. Lumber for Shimming and Blocking: Softwood lumber of hemlock species.

B. Primer: Alkyd primer sealer type.

C. Wood Filler: Solvent base, tinted to match surface finish color.

**2.8 FABRICATION:**

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

C. Apply laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

**2.9 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**

**3.1 EXAMINATION:**

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical and building items affecting work of this section are placed and ready to receive this work.

**3.2 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.

**3.3 PREPARATION FOR SITE FINISHING:**

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be contact with cementitious materials.

**3.4 ERECTION TOLERANCES:**

A. Maximum Variation from True Position: 1/16 inch.

**3.5 SCHEDULE:**

A. Refer to drawings and Section 00860 Color Placement Schedule for items.

**END OF SECTION**

# SECTION 06410
# CUSTOM CABINETS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Work described in this section:
   1. Plastic Laminate Clad cabinet units
   2. Countertops - Plastic Laminate and Solid Surfacing.
   3. Cabinet hardware.

### 1.2 RELATED SECTIONS:

A. Section 05750 - Perforated Metal Panels

### 1.3 REFERENCES:

A. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

B. FS MM-L-736 - Lumber, Hardwood.

C. FS MMM-A-130 - Adhesive, Contact; Federal Specifications and Standards; Revision B, 1974, and Amendment 3, 1976.

D. NHLA G-101 - Rules for the Measurement and Inspection of Hardwood and Cypress; National Hardwood Lumber Association; 1994.

E. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce); 1995.

F. PS 20 - American Softwood Lumber Standards; National Institute of Standards and Technology (Department of Commerce); 1994.

### 1.4 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.

C. Samples: Submit two samples, 8 x 8 inch is size, illustrating cabinet finish.

D. Samples: Submit two samples, illustrating counter top finish.

E. Samples: Submit two samples of drawer pulls, knobs and hinges, illustrating hardware finish.

### 1.5 QUALITY ASSURANCE:

A. Perform work in accordance with AWI P-200, Custom quality.

B. Perform cabinet construction in accordance with AWI P-200, Custom quality.

C. Manufacturer's Qualifications: Company specializing in manufacturing the products specified in

this section with minimum ten years of documented experience. There will be NO exceptions made for this requirement. This is based on the company and not individuals.

**1.6 DELIVERY, STORAGE, AND PROTECTION:**

A. Protect units from moisture damage.

**1.7 FIELD MEASUREMENTS:**

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

**1.8 COORDINATION:**

A. Coordinate the work with plumbing and electrical rough-in.

**PART 2 - PRODUCTS**

**2.1 PLASTIC LAMINATE CLAD CABINETS - MANUFACTURERS:**

A. Formica.

B. Weyenhauser - Product Softwood Lumber and Plywood.

C. Substitutions: See Section 01600 - Product Requirements.

**2.2 PLASTIC LAMINATE CLAD WOOD MATERIALS:**

A. Softwood Lumber: NIST PS 20; Graded in accordance with AWI P-200, Custom, average moisture content of 6 percent; species and grade as follows:
1. Cabinet Frame: Species Fir or Hemlock.

B. Hardwood Lumber: NHLA G-101; Graded in accordance with ASI P-200, Custom; average moisture content of 10 percent; species and grade as follows:
1. Cabinet frame: Species Oak.

**2.3 PLASTIC LAMINATE CLAD PANEL MATERIALS:**

A. Upper cabinet bottom, tops, shelves, vertical ends, dividers and doors shall be plastic laminate covered 3/4 inch industrial particleboard on both faces with laminated edge banding at exposed edges.

B. Base cabinet bottoms, shelves, drawer fronts, dividers and ends shall be plastic laminate covered 3/4 inch industrial particleboard on both faces with laminated banding at exposed edges.

C. All cabinet backs and drawer bottoms shall be 1/4 inch plastic laminate covered hardboard.

D. Drawer sides and backs shall be ½ inch fiberwood with plastic laminate on both faces.

E. Base cabinet bases and stretchers shall be 3/4 inch fir plywood supporting the full length of the cabinet, front and back.

F. Interior base and upper cabinet stretchers and nailers shall be plastic laminate covered 3/4 inch industrial particleboard.

G. Countertops and splashers shall be industrial particleboard with .050 inch laminated plastic on all exposed surfaces.

H. Front edges of all shelves shall have laminated edge banding.

**2.4 ALL EXPOSED SURFACES OF CABINETS (MILLWORK ITEMS) SHALL BE COVERED IN PLASTIC LAMINATE; COLOR AS NOTED ON COLOR PLACEMENT SCHEDULE.**

**2.5 LAMINATE MATERIALS:**

A. Plastic Laminate: AWI P-200, .625 inch General Purpose quality; through color, pattern, and surface texture as selected.
   1. Grade of laminated as needed to be applied to curved front of reception desk.

B. Laminate backing Sheet: 0.020 inch Backing Sheet grade, undecorated plastic laminate.

**2.6 SOLID SURFACE COUNTERTOPS:**

A. Formica. See Section 06650 - Solid Surfacing

**2.7 ACCESSORIES:**

A. Adhesive: FS MMM-A-130 contact adhesive.

B. Plastic Edge Trim: Extruded convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness; color as selected.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; plain finish in concealed locations and coated finish in exposed locations.

E. Concealed Joint Fasteners: Threaded Steel.

F. Grommets: Plastic material for cut-outs.

G. Perforated Metal panels

**2.8 HARDWARE:**

A. Drawer guides shall be KV-1300, 20 inch long (in standard 24 inch base cabinet) with almond epoxy finish.

B. Shelf supports shall be European system of drilled hole with pins and retainers.

C. Cabinet hinges shall be equal to concealed medium duty European 180 degrees hinge.

D. Doors and drawer pulls for plastic laminate clad cabinets shall be wire pull, brushed aluminum finish. Submit for approval.

E. Stainless steel stand-off hardware at perforated metal panels.

**2.9 FABRICATION:**

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings. Wrap in plastic for shipment and storage.

B. Fit shelves, doors and exposed edges with plastic edging. Use one piece for full length only.

C. Cap exposed plastic laminate finish edges with material of same finish and pattern.

D. Door and Drawer Fronts: 3/4 inch thick; flush style.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum from sink cut-outs.

G. Apply wood laminate by grain matching adjacent sheets to book matching.

H. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

I. Mechanically fasten back splash to countertops wit steel brackets at 16 inches on center. Anchoring to wall is not acceptable.

J. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

### 3.2 INSTALLATION:

A. Set and secure casework in place; rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

E. Secure cabinet to floor using appropriate angles and anchorages.

### 3.3 ADJUSTING:

A. Adjust moving or operating parts to function smoothly and correctly.

### 3.4 CLEANING:

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

**END OF SECTION**

# SECTION 06650
# SOLID SURFACING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Work described in this section:
   1. Windowsills
   2. Countertops

B. Related work specified elsewhere:
   1. Section 06200 - Finish Carpentry
   2. Section 06410 - Custom Cabinets

### 1.2 REFERENCES:

A. American National Standards Institute (ANSI)..

B. American Society for Testing and Materials (ASTM)

C. National Electrical Manufacturers Association (ANSI/NEMA LD 3-1995).

D. National Sanitation Foundation (NSF) Standard 51 use in both splash and food service areas.

E. New York State for fire gas toxicity (value = 74g.)

F. HUD Bulletin UM-73a.

G. New York City MEA 190-90M.

H. Canadian Standards Association (CSA) LM80490-6.

I. Resistance to Fungal and Bacterial Growth:
   1. ISO 846-1978 Method A - Fungi: complete agar medium. No mass change. Not a nutritive medium for microorganism.
   2. ISO 846-1978 Method B - Fungi: Complete agar medium. No mass change. Slight fungistatic effect.
   3. ISO 846-1978 - Bacteria: No significant mass change. No visual damage either by eye or microscope.
   4. ASTM G21 Fungal Resistance: No Growth.
   5. ASTM G22 Bacterial Resistance: No Growth.
   6. Chemical Resistance: Passes BS3203 part 2, 1991 Appendix E and also ANSI Z124.3 5.5-1995. Meets requirements for general and heavy use when cleaned using manufacturer recommendations.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.

C. Samples: Submit minimum 2" x 2-1/4" samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.

D. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.

E. Maintenance Data: Submit manufacturer's Use and Care Brochure (Form No. 11-118), including repair and cleaning instructions. Include in project closeout documents.

**1.4 QUALITY ASSURANCE:**

A. Allowable tolerances:
1. Variation in component size ±1/8" (3mm).
2. Location of openings:±1/8" (3mm) from indicated location.

B. Manufacturer's Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience. There will be NO exceptions made for this requirement. This is based on the company and not individuals.

**1.5 DELIVERY, STORAGE, AND PROTECTION:**

A. Protect surfaces from damage.

**1.6 FIELD MEASUREMENTS:**

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

**1.7 COORDINATION:**

A. Coordinate the work with casework and electrical rough-in.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

A. Solid Surfacing from Formica Corporation
1. Style: Signatures

B. Substitutions: See Section 01600 - Product Requirements.

**2.2 SOLID SURFACING FABRICATION:**

A. Material: Filled, polyester and acrylic, not coated, laminated or of composite construction, meeting relevant sections of ANSI Z124 and ANSI/NEMA LD3-1995 specifications.
1. Materials shall have minimum physical and performance properties specified
2. Superficial damage to a depth of 0.10" (2.5 mm) shall be repairable by sanding or refinishing.
3. Edge to be by surface to surface method of fabrication.

B. Windowsills and Countertop: ½" thick solid surfacing, having edge details as indicated on the architect's drawings.

C. Colors: See Specification Section 00860 - Color Placement Schedule.

**2.3 ACCESSORY PRODUCTS:**

A. Adhesives: For seams and drop edges, follow manufacturer's recommendations.

**2.4 FABRICATION:**

A. Factory fabricate components to sizes and shapes indicated, in accordance with approved shop drawings.

B. No joints allowed on windowsills.

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and product installation data.

B. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Keep clean until Date of Substantial Completion.

C. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction.

**3.2 CLEANING:**

A. Clean in accordance with manufacturer's recommendations.

**END OF SECTION**

# SECTION 07190
# WATER REPELLENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Water repellents applies to exterior masonry and concrete surfaces.

### 1.2 SUBMITTALS:

A. See Section 01300 - Submittals for submittal procedures.

B. Product Data: Provide product description, details of tests performed, limitations, and chemical composition.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.3 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum three years documented experience.

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

### 1.4 ENVIRONMENTAL REQUIREMENTS:

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.

### 1.5 WARRANTY:

A. Upon completion and acceptance of the work the following written warranty shall be provided to the Owner prior to final payment.
   1. Installer's two-year guarantee against defects, water penetration, efflorescence, discoloring, etc.
   2. Manufacturer's Ten Year Non-Prorated Labor and Materials Warranty for moisture penetration. Five year material and labor warranty on concrete block.
   3. The water repellent coating application shall be subjected to a Rilem II.4 test to verify that the application complies with the manufacturer's requirements for the desired protection.

### 1.6 EXTRA MATERIALS:

A. See Section 01600 - Product Requirements, for additional provisions.

B. Provide two gallons of water repellent.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. ProSoCo, Inc.; Kansas City, Kansas.
   1. Product: Weather Seal Siloxane WB.

B. Substitutions: See Section 01600 - Product Requirements.

### 2.2 MATERIALS:

A. Water Repellent: Silane; colorless.
   1. Solids by Volume: 20 percent, minimum.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify joint sealants are installed and cured.

B. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

### 3.2 PREPARATION:

A. Do not start work until substrate is cured a minimum of 28 days.

B. Remove loose particles and foreign matter.

C. Remove oil or foreign substance with a chemical solvent which will not affect water repellent.

D. Scrub and rinse surfaces with water and let dry.

### 3.3 APPLICATION:

A. Apply water repellent in accordance with manufacturer's instructions.

B. Apply at a rate of 100 s.f./gal. by airless spray.

C. Apply two coats.

### 3.4 PROTECTION OF ADJACENT WORK:

A. Protect adjacent landscaping, property, and vehicles from 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 07212
# BOARD AND BATT INSULATION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Board insulation at perimeter foundation wall.

B. Batt insulation in exterior wall construction. (See Section 07213 - Pre-Engineered Building Insulation)

C. Sound attenuation batt insulation in interior wall construction.

D. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

### 1.2 REFERENCES:

A. ASTM C 240 - Standard Test Methods of Testing Cellular Glass Insulation Block; 1991.

B. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 1995.

C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1995.

D. ASTM C 1013 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Roof Insulation; 1994.

E. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 1994.

F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 1995.

G. FS HH-I-521 - Insulation Blankets, Thermal, (Mineral Fiber for Ambient Temperatures).

H. FS HH-I-558 - Insulation, Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type).

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Owens-Corning

B. Substitutions: See Section 01600 - Product Requirements.

### 2.2 BOARD INSULATION MATERIALS:

A. Extruded Polystyrene Board Insulation: ASTM C 578, Type VI; Extruded expanded polystyrene board with cut cell surfaces; with the following characteristic:
   1. Board size: 24 x 96 inch.
   2. Board thickness: 2 inches.
   3. Board edges: square.
   4. Thermal Resistance: R of 5.0 per inch thickness.
   5. Substitutions: See Section 01600 - Product Requirements.

B. Sound Attenuation Board Insulation.
   1. Georgia Pacific "Hushboard"
   2. Substitutions: See Section 0166- - Product Requirements

**2.3 BATT INSULATION MATERIALS:**

A. Batt Insulation: Refer to Section 07213 - Pre-Engineered Building Insulation
   1. Thermal Resistance: R of 19 in walls.
   2. Facing: Per Section 07213.

B. Substitutions: See Section 01600 - Product Requirements.

C. Sound Attenuation Batt Insulation:
   1. Thickness: As required to fill wall cavity.
   2. Substitutions: See Section 01600 - Product Requirements.

**PART 3 - EXECUTION**

**3.1 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.

**3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER:**

A. Install boards vertically on foundation perimeter and beneath slab perimeter as shown on drawings.
   1. Place boards to maximize adhesive contact.
   2. Stagger end joints.
   3. Butt edges and ends lightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

**3.3 BATT INSULATION:**

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Install Sound Attenuation Batt Insulation in all interior walls.

D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

E. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

F. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

G. Fasten facing flanges in place at maximum 6 inches on center. Use approved means for wood or metal framing as required.

H. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

**3.4 PROTECTION OF FINISHED WORK:**

A. Do not permit installed insulation to be damaged prior to its concealment.

**3.5 SCHEDULES:**

A. Refer to drawings for type and placement.

**END OF SECTION**

# SECTION 07213
# PRE-ENGINEERED BUILDING INSULATION

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Pre-Engineered Building Insulation for New Construction.

### 1.2 RELATED SECTIONS:

A. Section 13121 - Pre-Engineered Metal Buildings.

B. Division 15 - Mechanical; Rough-in utilities.

C. Division 16 - Electrical; Rough-in utilities.

### 1.3 REFERENCES:

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure B).

C. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

E. ASTM C 1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

### 1.4 DESIGN REQUIREMENTS:

A. Thermal Resistance of Installed System: R-Value of Walls - R-19 minimum and Roof - R-30 minimum.

B. Insulating system shall have a continuous vapor barrier inside of building purlins, girts, and insulation to provide complete isolation from inside conditioned air.

### 1.5 SUBMITTALS:

A. Submit under provisions of Section 01300.

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 instructions.

C. Shop Drawings: Indicate locations of connections and attachments, general details, anchorages and method of anchorage and installation.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square or long, representing actual products required for this project.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

### 1.6 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing product systems specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing work of this section.

### 1.7 DELIVERY, STORAGE, AND HANDLING:

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

B. Store products indoors and protect from moisture, construction traffic, and damage.

## 1.8 PROJECT CONDITIONS:

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS:

A. Acceptable Manufacturer: Thermal Design, Inc., Simple Saver System. P.O. Box 468, 601 N. Main Street, Madison, NE 68748. ASD. Tel: (800) 255-0776 or (402) 454-6591. Fax: (402) 454-2708. Email: sales@thermaldesign.com , www. thermaldesign.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

## 2.2 MATERIALS:

A. Simple Saver System consists of Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components in a proprietary insulation system as follows:
   1. Batt Insulation: ASTM C 665; preformed glass fiber batt conforming to the following:
      a. Thermal Resistance: R of 19.
      b. Batt Size: Equal to purlin/girt spacing by manufacturer's standard lengths.
      c. Unfaced.
   2. Roof Insulation: Fiberglass batt or fiberglass blanket complying with ASTM C 665 and ASTM E 84 with a thermal resistance and thickness as follows:
      a. As indicated on the drawings.
      b. R-30; 9-1/2 inches (241 mm), 6 inches (152 mm) plus 3-1/2 inches (89 mm) (two layers).
   3. Wall Insulation: Fiberglass blanket or batt complying with ASTM C 665 and ASTM E 84 with a thermal resistance and thickness as follows:
      a. R-19; 6 inches (152 mm).
   4. Vapor Barrier Liner Fabric: Syseal type woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:
      a. Product complies with ASTM C 1136, Types I through Type VI.
      b. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
      c. Flame/Smoke Properties:
         1) 25/50 in accordance with ASTM E 84.
         2) Self-extinguishes with field test using matches or butane lighter.
      d. Ultra violet radiation inhibitor to minimum UVMax rating of 8.
      e. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
      f. Provide with factory double, extrusion welded seams. Stapled seams or heat melted seams are not acceptable.
      g. Factory-folded to allow for rapid pull-out on strap support system.
      h. Color: White.
   5. Vapor Barrier Lap Sealant: Solvent-based, Simple Saver polyethylene fabric adhesive.
   6. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch (19 mm) wide by 1/32 inch (.79 mm) thick made from same material as liner fabric.
   7. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches (76 mm) wide made from same material as Syseal type liner fabric.
   8. Thermal Breaks:
      a. Thermal breaks not required with two layer system specified above.
   9. Straps:
      a. 100 KSI minimum yield tempered, high-tensile-strength steel.
      b. Size: Not less than 0.020 inch (0.50 mm) thick by 1 inch (25 mm) by continuous length.
      c. Galvanized, primed, and painted to match specified finish color on the exposed side.
      d. Color: White.
   10. Fasteners:
      a. For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
      b. For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
      c. For wood, concrete, other materials: As recommended by manufacturer.
   11. Wall Insulation Hangers:Fast-R preformed rigid hangers, 32 inch (813 mm) long galvanized steel strips with barbed arrows every 8 inches (203 mm) along its length.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify that building structure including all bracing and any concealed building systems are completed and approved prior to installing liner system and insulation in the structure.

B. Correct any unsatisfactory conditions before proceeding.

C. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 INSTALLATION - GENERAL:

A. Install pre-engineered building insulation system in accordance with manufacturer's installation instructions and the approved shop drawings.

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

C. Install in exterior spaces without gaps or voids. Do not compress insulation.

D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

E. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.

### 3.3 ROOF INSULATION INSTALLATION:

A. Straps:
1. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
2. Tension straps to required value.

B. Vapor Barrier Fabric:
1. Install vapor barrier fabric in large one piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
2. Position pre-folded fabric on the strap platform along one eave purlin.
3. Clamp the two bottom corners at the eave and also centered on the bay.
4. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.
5. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
6. Trim edges and seal along the rafters.
7. All seams must be completely sealed and stapled seams not acceptable.

C. Insulation:
1. Unpack, and shake to a thickness exceeding the specified thickness.
2. Ensure that cavities are filled completely with insulation.
3. Place on the vapor barrier liner fabric without voids or gaps.

D. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.

### 3.4 WALL INSULATION INSTALLATION:

A. Insulation:
1. Install thermal break to exterior surface of girts as wall sheathing is applied.
2. Position and secure Fast-R hangers to girts on the inside face of the wall sheathing.
3. Cut insulation to required lengths to fit vertically between girts.
4. Neatly position in place and secure to Fast-R hangers.
5. Ensure that cavities are filled completely with insulation.
6. Fluff the insulation to the full specified thickness.

B. Vapor Barrier Fabric:
1. Install vapor barrier fabric in large one piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
2. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them..

3. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
4. All seams must be completely sealed and stapled seams not acceptable.

C. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.

**3.5 CLEANING:**

A. Clean dirt or exposed sealant from the exposed vapor barrier fabric.

B. Remove scraps and debris from the site.

**3.6 PROTECTION:**

A. Protect system products until completion of installation.

B. Repair or replace damaged products before completion of insulation system installation.

**3.7 SCHEDULE:**

A. Wall Insulation Vapor Barrier Liner Fabric, all accessories: R-19, Color white.

B. Roof Insulation Vapor Barrier Liner Fabric, Straps and other Exposed accessories: R-30; Color White.

**END OF SECTION**

# SECTION 07222
# ROOF BOARD INSULATION

## PART 1- GENERAL

### 1.1 SECTION INCLUDES:

A. Rigid board type roof insulation for thermal protection as part of roofing assemblies.

B. Recover board roof insulation.

C. Roofing crickets.

### 1.2 SUBMITTALS:

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's specifications and installation instructions for insulation board and fasteners.

C. Samples:
1. Submit 6 inch by 6 inch samples of each board type required.
2. Submit samples of each fastener type required.

D. Shop Drawings: Roof plan showing layout of boards and fastening patterns.

E. Certificates: Manufacturer's certification that materials meet specification requirements.

F. Warranty: Submit sample warranty indicating conditions and limitations.

### 1.3 DELIVERY, STORAGE, AND HANDLING:

A. Deliver insulation in packages labeled with material name, thermal value, and product code.

B. When stored outdoors, stack insulation on pallets above ground or roof deck and cover with tarpaulin or other suitable waterproof coverings.

### 1.4 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.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Acceptable Manufacturers include, but are not limited to: Atlas Roofing Corporation, 1175 The Exchange, Suite 160, Atlanta, GA 30339; ASD. Tel: (770) 952-1442, Fax: (770) 952-3170.

### 2.2 MATERIALS:

A. Provide rigid insulation boards in combinations of level and tapered sheets as recommended by roofing membrane manufacturer, to meet the minimum conditions and intent as outlined in the

contract documents, to provide for the positive drainage of water on the new roof surface, to provide a watertight roof for the building and to meet all requirements for obtaining roofing system warranties. **PRODUCT SUBMITTALS ARE REQUIRED FOR ALL INSULATION MATERIALS PROPOSED TO BE USED.**

**2.3 RELATED MATERIALS:**

A. Fasteners: Factory Mutual approved standard.

B. Base Ply: As recommended by membrane manufacturer.

C. Asphalt Bitumen: ASTM D 312, Type III (steep), or Type IV.
1. Use only on approved board insulation types.
2. Provide with labels indicating flash point, softening point, finished blowing temperature, and equiviscous temperature.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Examine roof deck for suitability to receive insulation. Certify that substrate is dry, clean, and free of foreign material that will damage insulation or impede 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.
1. Start of installation indicates installer accepts conditions of existing deck surfaces.

**3.2 INSTALLATION:**

A. Install specified insulation in accordance with manufacturer's latest printed instructions and as required by governing codes and owner's insurance carrier.
1. Use mechanical fasteners to secure insulation.

B. Install with end joints staggered; avoid having insulation joints coinciding with joints in deck.

C. In multi-layer installations, stagger joints in top and bottom layers.

**3.3 CLEANING AND PROTECTION:**

A. Remove trash and constructin 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 07272
# WEATHER RESISTANT MEMBRANE FABRIC

## PART 1 - GENERAL

### 1.1 SUMMARY:

A. Includes but not limited to:
   1. Furnish and install weather resistive barriers on exterior side of exterior wall sheathing as described in Contract Documents.

### 1.2 REFERENCES:

A. ASTM E-96-90 "Standard Test Method for Water Transmission of Material"

B. ASTM E-1677-95 "Standard Specifications for an air Retarder (AR) Material or System for Low-Rise Framed Building Walls".

C. AATCC-127 "Hydrostatic Head Test".

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals for submittal procedures.

B. Quality Assurance:
   1. Submit copies of test results showing performance characteristics equaling or exceeding those specified.
   2. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Manufacturer's Installation Instructions: Indicate special procedures.

## PART 2 - PRODUCTS

### 2.1 WATER RESISTANT BARRIER FABRIC:

A. Spunbonded olefin, Non-woven, Non-performed.

B. Performance Characteristics:
   1. ASTM E-1677 Type I Air Retarder, Air leakage at 25 mph (75 Pa) wind pressure of less than 0.6 cfm/ft. squared.
   2. Water Vapor Transmission of greater than 20 perms in accordance with ASTM E-96-90, Method B.
   3. Water penetration resistance of 200 cm on hydrostatic head in accordance with AATCC-127.

C. Approved Manufacturers:

   1. Tyvek "Commercial" Wrap by DuPont Company, Wilmington, DE.

### 2.2 SEALING TAPE/FASTENERS:

A. Approved Tape Manufacturers:
   1. DuPont Contractor Tape as manufactured by DuPont Company , Wilmington, DE.

B. Recommended Fasteners for Wood, Insulated Sheathing Board, Exterior Gypsum.
   1. Nails with large heads or plastic washer heads.

C. Recommended Fasteners for Steel Frame construction:
   1. Rust resistant screws with washers.

D. Recommended Fastening to Masonry:
   1. Polyurethane or elastomeric adhesives

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

A. Install in accordance with Manufacturer's instruction over exterior sheathing. Seal joints and penetrations through weather resistive barrier with specified tape and fasteners prior to installation of finish material. Air infiltration barrier shall be air tight and free from holes, tears, and punctures. All window and door penetrations are to be flashed and sealed per manufacturer instructions.

**END OF SECTION**

# SECTION 07410
# METAL EXTERIOR WALL & SOFFIT PANELS AND INTERIOR WALL PANELS

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes: Factory-formed metal roof and wall panels, including fascia, soffit and liner panels and includes:

1. Factory-formed panels in vertical installation.
2. Factory-formed panels in horizontal installation.
3. Metal flashings and trim.

B. Related Sections: Section(s) related to this section include:

1. Metals: Division 5.
2. Building Insulation: Division 7 Building Insulation Section.
3. Sealants: Division 7 Joint Sealers Sections.
4. Section 13121 – Pre-Engineered Building

### 1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A653/A653M Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
4. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
5. ASTM E1680 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Metal Roof Systems Under Specified Pressure Differences Across the Specimen.
6. ASTM E1646 Standard Test Method for Water Penetration of Metal Roof Systems by Uniform Static Air Pressure Difference.
7. ASTM G90 Standard Practice for Performing Accelerated Outdoor Weathering of Non-Metallic Materials Using Concentrated Natural Sunlight.

### 1.03 SYSTEM DESCRIPTION

A. Panel Performance Requirements: Provide panels, which have 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 or infiltration of water.

Multi-Rib

1. Air Infiltration: Maximum 0.007 cfm/lf (0.039 $m^3$/hr/m ) of seam at static pressure of +/-6.24 psf (0.30 kPa) when tested per ASTM E1680.
2. Water Penetration: No uncontrolled water penetration through the panel joints at a static pressure of 12.0 psf (0.57 kPa) when tested in accordance with ASTM E1646.

Mega-Rib

3. Air Infiltration: Maximum 0.011 cfm/lf (0.061 $m^3$/hr/m) of seam at static pressure of +/-6.24 psf (0.30 kPa) when tested per ASTM E1680.
4. Water Penetration: No uncontrolled water penetration through the panel joints at a static pressure of 12.0 psf (0.57 kPa) when tested in accordance with ASTM E1646.

R-Panel

5. Air Infiltration: Maximum 0.011 cfm/lf (0.061 $m^3$/hr/m) of seam at static pressure of +/-6.24 psf (0.30 kPa) when tested per ASTM E1680.

6. Water Penetration: No uncontrolled water penetration through the panel joints at a static pressure of 12.0 psf (0.57 kPa) when tested in accordance with ASTM E1646.

B. Finish Performance Requirements:

1. Color Change and Fade Resistance: No cracking, peeling, blistering or loss of adhesion when tested in accordance with ASTM G23; color change, after removal of surface deposits such as dirt or chalk, maximum 5 Δ Hunter units.

2. Humidity Resistance: No blistering, peeling or loss of adhesion, after 2000 hours testing in accordance with ASTM D2247.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product data for specified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.

1. Indicate layout of panels and panel sizes, including custom-fabricated panels if indicated; indicate each item of trim and accessories.

2. Indicate in detailed drawings profile and gauge of interior and exterior sheets, and locations and types of fasteners; indicate locations, gauges, shapes and methods of attachment of panels, trim and accessory items.

3. Indicate products/materials required for construction activities of this section not supplied by manufacturer of products of this section.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

1. Selection Samples: For each product requiring color selection, 2 sets of manufacturer's sample chips representing full range of colors and finishes available.

2. Verification Samples: For each color and finish selected, 2 chips indicating match to selected color and finish.

E. Quality Assurance Submittals: Submit the following:

1. Contractor Certificates: Contractor's certification that:

a. Manufacturer of products of this section meets specified qualifications.

b. Installer of products of this section meets specified qualifications.

2. Manufacturer Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.

3. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:

1. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

1. Certificate: When requested, submit certificate indicating qualification.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Architectural Sheet Metal Manual.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination, Project Meetings Section.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

1. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 label where appropriate.

C. Packing, Shipping, Handling and Unloading:

1. Bundle panels in waterproof wrapping paper when nested, or wooden crates when panels cannot be nested.

2. Package trim and accessories in waterproof wrapping paper.

D. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above-ground location.

1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture run off.

2. Store products of this section in manufacturer's unopened packaging until installation of products.

3. Maintain dry, heated storage area for products of this section until installation of products.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions. Manufacturer's Warranty: Submit, for Owner's acceptance, a sample of manufacturer's standard warranty document.

1. Warranty Period: 15 years commencing on Date of Substantial Completion.

**PART 2 PRODUCTS**

2.01 METAL WALL PANELS

A. Basis of Design:Manufacturers:

1. Firestone Building Products, 1001 Lund Blvd, Anoka, MN 55330, (800) 426-7737, www.firestonebpco.com.

2. McElroy Metal, Inc, 1500 Hamilton Rd., Bossier City, LA 71111; Telephone: (800) 562-3576, (318) 747-8097; Fax: (318) 747-8099; E-mail: info@mcelroymetal.com; website: www.mcelroymetal.com.

3. Equivalent panels by others, including Berridge Manufacturing Co. that meet the panel specifications, including profiles, texture, and finish colors available, may be considered upon submission, review and approval per Section 01600 – Product Requirements.

B. Substitutions: Will not be considered if product does not offer the same or vary similar options, as determined by the Architect, that match specified product features including but not limited to material, profile, finish, color, texture, pattern, etc where applicable.

2.02 MANUFACTURED UNITS

A. Firestone Delta Series Panel CFP-16F (where indicated on drawings):

1. Panels shall be 7/8 inches in depth and coverage shall be 16 inches.

2. The panels shall have an interlocking side lap feature which conceals the fasteners requiring panel clips to allow for thermal movement or no panel clips as recommended by panel manufacturer.

3. The panels shall have factory applied sealant concealed within the interlocking joint.

4. Panels shall have common interlocking side joints to allow for multiple panel profile combinations.

5. Exposed panel fasteners are unacceptable.

6. Steel Panels: ATM A653, G90 (lock forming quality), extra smooth, tension-leveled, galvanized steel, minimum spangle.

7. Thickness: 24 gauge.

8. Texture: Panels shall be smooth.

B. McElroy Metal Mega-Rib Panel:

1. Profile: Longitudinal ribs 1 1/2" (38 mm) deep, spaced 7.2" (183 mm) on center.

2. Size: 36" (914 mm) cover width, lengths indicated on drawings.

3. Material: Galvanized steel sheet conforming to ASTM A653, G90 coating for bare; AZ50 coating for painted; [-] gauge sheet thickness.

4. Finish: Manufacturer's standard white polyester coating.

5. Finish: Bare.

6. Finish: Siliconized polyester color coat applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

7. Finish: Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from full range of manufacturer's standard colors.

b. Color: [Specify color.].

c. Color: Specified in Schedule at end of section.

C. McElroy Metal Mini-Rib Panel:

1. Profile: Longitudinal ribs 3/8" (9.5 mm) deep, spaced 3" (76 mm) on center.

2. Size: 36" (914 mm) cover width, lengths indicated on drawings.

3. Material: Galvalume steel sheet conforming to ASTM A792, AZ55 coating for bare; AZ50 coating for painted; [-] gauge sheet thickness.

4. Finish: "KYNAR 500", PVDF, Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from manufacturer's metallic colors.

D. McElroy Metal Multi-Cor Corrugated Panels:

1. Profile: Longitudinal ribs 7/8" (22.2 mm) deep, spaced 2.67" (68 mm) on center, 35 1/2" (902 mm) sheet width.

2. Size: 31 3/8" (813 mm) cover width, lengths indicated on drawings.

3. Material: Galvalume steel sheet conforming to ASTM A792, AZ50 coating for painted; 24 gauge sheet thickness.

4. Finish: "KYNAR 500", PVDF, Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from of manufacturer's metallic colors.

E. McElroy M-Cor Corrugated Panel:

1. Profile: Longitudinal ribs 1/2" (12.7 mm) deep, spaced 2.67" (68 mm) on center, 39 3/8" (1000 mm) sheet width.

2. Size: 37 3/8" (949 mm) cover width for wall applications, lengths indicated on drawings.

3. Size: 34 7/8 (886 mm) cover width for sidewall applications, lengths indicated on drawings.

4. Material: Galvalume steel sheet conforming to ASTM A792, AZ50 coating for painted; 24 gauge sheet thickness.

5. Finish: "KYNAR 500", PVDF, Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from manufacturer's metallic colors.

F. McElroy MarqueeLok Wall, Soffit and Fascia Panel

1. Profile: 1" deep pan profile.

a. Flat Pan

2. Size: 12" cover width, lengths indicated on drawings.

3. Material: Galvalume steel sheet conforming to ASTM A792, AZ50 coating for painted; 24 gauge sheet thickness.

4. Finish: "KYNAR 500", PVDF, Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from full range of manufacturer's standard colors.

G. McElroy Metal R-Panel:

1. Profile: Major longitudinal ribs 1 1/4" (32 mm) deep, spaced 12" (305 mm) on center; minor longitudinal ribs centered between major ribs, spaced 4" (102 mm) on center panel; normal-run where ribs protrude from panel plane, viewed from exterior, reverse-run where ribs recede from panel plane, viewed from exterior.

2. Size: 36" (914 mm) cover width, lengths indicated on drawings.

3. Material: Galvalume Sheet Steel conforming to ASTM A792; AZ50 coating for painted; 24 gauge sheet thickness.

4. Finish: "KYNAR 500", PVDF, Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from full range of manufacturer's standard colors.

H. Trim:

1. Manufacturer's standard sheet metal matching panel material and finish, break-formed to profiles indicated on drawings, and including, but not limited to:

a. Copings.

b. Gravel stops.

c. Gutters and downspouts.

d. Termination and transition strips.

2. Color: Match panel finish.

3. Color: Selected from full range of manufacturer's standard colors and metallic colors to match adjacent panel colors.

I. Clips and Fasteners: Supply items required for installation of panels in accordance with manufacturer's installation instructions and other indicated items; supply galvanized clips and fasteners.

2.03 MATERIALS

A. Aluminum Sheet: ASTM B209, aluminum and aluminum alloy 3105 with H14 temper in accord with manufacturer's standard to suit forming operations and finish specified.

B. Galvanized Steel Sheet: ASTM A653, G90 steel sheet, zinc coated (galvanized) by hot dip process, structural quality.

2.04 RELATED MATERIALS

A. General: Coordinate use of related materials:

1. Underlayment: Refer to Division 7 Roofing Section.

2. Plywood Deck: Refer to Division 6 Rough Carpentry Section.

3. Sealants: Refer to Division 7 Joint Sealants Section.

2.05 SOURCE QUALITY

A. Source Quality: Obtain metal panel products from a single manufacturer.

**PART 3 EXECUTION**

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.

1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of roofing panels.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

1. Verification of Conditions:

a. Panel support systems are ready for construction activities of this section and within specified tolerances.

b. Rough-in utilities are in correct locations.

2. Installer's Examination:

a. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.

b. Transmit 2 copies of installer's report to Architect within 24 hours of receipt.

c. Delay construction activities of this section until unacceptable conditions have been corrected.

d. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.03 PREPARATION

A. Coordination: Coordinate metal roofing with other work including drainage, flashing and trim, deck substrates, parapets, copings, walls and other adjoining work to provide a noncorrosive and leakproof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3.04 INSTALLATION

A. General: Install metal roofing panels to profiles, patterns and drainage indicated and required for leakproof installation. Provide for structural and thermal movement of work. Seal joints for leakproof installation.

1. Seams: Provide uniform, neat seams.

2. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.

3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for sealant installation.

B. Panel Installation:

1. Install panels plumb, true and in correct alignment with structural framing, in accordance with shop drawings and manufacturer's printed installation instructions.

2. Install panels in horizontal installations using manufacturer's concealed fastening system only; sight-exposed fasteners are prohibited.

3. Install panels in vertical installations using manufacturer's concealed fastening system or non-corroding fasteners color-matched to panel.

4. Install trim using concealed fasteners where possible; sight-exposed non-corroding fasteners color-matched to trim are permitted on vertical surfaces only.

C. Installation Tolerances:

1. Variation from Plumb: Maximum 1/8" (3.2 mm) in 20 feet (6.096 m).

2. Variation from Level: Maximum 1/8" (3.2 mm) in 20 feet (6.096 m).

3. Variation from True Plane: Maximum 1/8" (3.2 mm) in 20 feet (6.096 m).

3.05 FIELD QUALITY REQUIREMENTS

A. Site Tests (Post-Installation Testing): Owner reserves right to perform post-installation testing of installed metal panel installation.

B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

1. Remove strippable coating and perform dry wipe-down cleaning of panels as erected.

3.07 PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction.

1. Protect installed products from damage by subsequent construction activities.

2. Replace products having damage other than minor finish damage.

3. Repair products having minor damage to finish in accordance with panel manufacturer's recommendations.

4. Architect shall be sole judge of acceptability of repair to damaged finishes; replace products having rejected repairs.

3.08 SCHEDULES

A. Refer to drawings for proposed locations of panel types.

**END OF SECTION**

Rev. 1/11

# SECTION 07551
# MODIFIED BITUMEN, TORCH APPLIED MEMBRANE ROOFING SYSTEM

## PART 1 GENERAL

### 1.01 SUMMARY

A. Furnish and install modified bitumen sheet roofing system, including:
   1. Roofing manufacturer's requirements for the specified warranty.
   2. Removal of entire existing roof membrane and flashings.
   3. Removal of all existing insulation down to the deck.
   4. Preparation of roofing substrates.
   5. Wood nailers for roofing attachment.
   6. Insulation.
   7. Modified bitumen roofing.
   8. Metal roof edging and copings.
   9. Flashings.
   10. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete weatherproof roofing system.

C. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

D. Comply with the published recommendations and instructions of the roofing membrane manufacturer, at http://manual.fsbp.com.

E. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

### 1.02 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

B. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2004.

C. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2001.

D. ASTM D 6222 - Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements; 2002.

E. PS 1 - Construction and Industrial Plywood; 1995.

F. PS 20 - American Softwood Lumber Standard; 2005.

### 1.03 SUBMITTALS

A. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include at least the following:
      a. Technical data sheet for roof membrane.
      b. Technical data sheet for each insulation type.

B. Submit layout drawings illustrating insulation layout, including tapered crickets.

C. Samples: Submit samples of at least the following:

1. Sample of roof membrane.
2. Sample of each insulation type.

D. Specimen Warranty: Submit prior to starting work.

E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

G. Executed Warranty.

**1.04 QUALITY ASSURANCE**

A. Applicator Qualifications: Roofing installer shall have the following:
1. Current Firestone Master Contractor status.
2. Fully staffed office within 100 miles of the job site.
3. At least five years experience in installing specified system.
4. Capability to provide payment and performance bond to building owner.

B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
2. Notify A. C. Williams well in advance of meeting.

**1.05 DELIVERY, STORAGE AND HANDLING**

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

**1.06 WARRANTY**

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: Firestone 20 year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
1. Limit of Liability: No dollar limitation.
2. Scope of Coverage: Repair leaks in the roofing system caused by:
   a. Ordinary wear and tear of the elements.
   b. Manufacturing defect in Firestone brand materials.
   c. Defective workmanship used to install these materials.
   d. Damage due to winds up to 55 mph (88 km/h).
3. Not Covered:
   a. Damage due to winds in excess of 55 mph.
   b. Damage due hurricanes or tornadoes.
   c. Hail.
   d. Intentional damage.
   e. Unintentional damage due to normal rooftop inspections, maintenance, or service.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

A. Acceptable Manufacturer - Roofing System: Firestone Building Products Co., Carmel, IN. www.firestonebpco.com.
1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following

qualifications:

a. Specializing in manufacturing the roofing system to be provided.
b. Minimum ten years of experience manufacturing the roofing system to be provided.
c. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.
d. ISO 9002 certified.
e. Able to provide isocyanurate insulation that is produced in own facilities.
f. Roofing systems manufactured by the companies listed below are acceptable provided they are completely equivalent in materials and warranty conditions:

B. Manufacturer of Insulation: Same manufacturer as roof membrane.

C. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
1. Metal roof edging products by other manufacturers are not acceptable.
2. Field- or shop-fabricated metal roof edgings are not acceptable unless they are covered under the terms and conditions of the low slope roofing system warranty.

D. Substitution Procedures: See Instructions to Bidders.
1. Submit evidence that the proposed substitution complies with the specified requirements. There will not be any system substitutions, only manufacturers with like products with equal or greater physical properties will be considered in the substitution. The owner and design professional will review all substitutions and have the right to reject any package contrary to this specification.

## 2.02 ROOFING SYSTEM DESCRIPTION

A. Roofing System:
1. Membrane: APP modified bitumen, 3 ply.
2. Thickness: MB Base SA, APP160, APP 180 .
3. Comply with applicable local building code requirements.

B. Insulation:
1. Total R Value: 30, minimum. Two layers of 2.5" Polyiso with tapered crickets installed as necessary for positive drainage
2. Base Layer: Polyisocyanurate foam board, non-composite.
a. Attachment: HD Fasteners

## 2.03 APP MODIFIED BITUMEN MATERIALS

A. Cap Sheet: Granule surfaced, torch grade, APP polymer-modified bitumen sheet, complying with ASTM D 6222, Type I, Grade G, reinforced with non-woven polyester fabric, with the following additional characteristics:
1. Reinforcing Fabric: 5.3 oz per sq yd (180 g/sq m), with continuous fiberglass strands in machine direction.
2. Nominal Thickness: 0.165 inch (4.2 mm).
3. Sheet Width: 3.3 feet (1 m), nominal.
4. Granule Color: White.
5. Acceptable Product: APP 180 by Firestone.

B. Interply Sheet: Smooth surfaced, torch grade, APP polymer-modified bitumen sheet, reinforced with non-woven polyester fabric, complying with ASTM D 6222, Type I, Grade S, and with the following additional characteristics:
1. Reinforcing Fabric: 5.3 oz per sq yd (180 g/sq m), with continuous fiberglass strands in machine direction.
2. Nominal Thickness: 0.150 inch (3.8 mm).
3. Post Consumer Recycled Content: 8 percent, nominal.
4. Sheet Width: 3.3 feet (1 m), nominal.
5. Acceptable Product: APP 160 W by Firestone.

C. Base Sheet: Self-adhesive SBS polymer-modified bitumen sheet, reinforced with non-woven glass fiber fabric, self-adhesive surface and release film on bottom, complying with ASTM D 1970, formulated as base layer for torch applied cap sheets, and with the following additional characteristics:

1. Nominal Thickness: 0.060 inch (1.5 mm).
2. Sheet Width: 3.3 feet (1 m), nominal.
3. Acceptable Product: Baseguard SA by Firestone.

## 2.04 ROOF INSULATION

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C 1289 Type II Class 1, with the following additional characteristics:
   1. Thickness: Two layers of 2.5" with tapered crickets installed between drain locations as listed on the roof plans
   2. Size: 48 inches (1220 mm) by 96 inches (2440 mm), nominal.
      a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches (1220 mm) by 48 inches (1220 mm), nominal.
   3. R Value to be 30
   4. Compressive Strength: 20 psi (138 kPa) when tested in accordance with ASTM C 1289.
   5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
   6. Recycled Content: 19 percent post-consumer and 15 percent post-industrial, average.
   7. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation by Firestone.

B. Adhesive for Insulation Attachment: Type as required by roof membrane manufacturer for roofing system and warranty to be provided; use only adhesives furnished by roof membrane manufacturer.

## 2.05 METAL ACCESSORIES

A. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated
   1. Material and Finish: 24 gage, 0.024 inch (0.06 mm) thick galvanized steel with Kynar 500 finish in manufacturer's standard color; matching concealed joint splice plates; factory-installed protective plastic film.

## 2.06 ACCESSORY MATERIALS

A. Wood Nailers: PS 20 dimension lumber, Structural Grade No. 2 or better Southern Pine, Douglas Fir; or PS 1, APA Exterior Grade plywood; pressure preservative treated.
   1. Width: 3-1/2 inches (90 mm), nominal minimum, or as wide as the nailing flange of the roof accessory to be attached to it.
   2. Thickness: Same as thickness of roof insulation.

# PART 3 INSTALLATION

## 3.01 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with

sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

**3.02 EXAMINATION**

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

**3.03 PREPARATION**

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch (6 mm) wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

**3.04 INSULATION INSTALLATION**

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. 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.

C. Lay roof insulation in courses parallel to roof edges.

D. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch (6 mm). Fill gaps greater than 1/4 inch (6 mm) with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch (6 mm).

E. Mechanical fastening: Install insulation with Heavy Duty fasteners and plates at the rate necessary to achieve the Firestone Red Shield warranty and to meet code requirements.

**3.05 MODIFIED BITUMEN INSTALLATION BY HEAT WELDING (TORCH)**

A. Self-Adhered Interply Base Sheet:

B. Start at the low point with a full width sheet, fully unrolled and aligned; align and unroll remaining sheets during heat fusing operation.

C. Fully heat weld sheets to substrate using methods recommended by roof membrane manufacturer.

D. Maintain 3 inch (75 mm) side laps and 6 inch (150 mm) end laps.

E. Granule Surfaced Sheets: In areas that form the substrate for heat fusing, such as laps, flashings, and patches, embed the granules prior to fusing subsequent sheet. Apply additional granules to all exposed surfaces that have none or cover with additional piece of granule surfaced material.

F. Complete the entire membrane installation without undue delay.

## 3.06 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.
   3. Install water block sealant under the membrane anchorage leg.
   4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
   5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
   6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
   7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Existing Scuppers: Remove scupper and install new scupper.

D. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches (200 mm) high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

E. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
   2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches (50 mm) deep, with at least 1 inch (25 mm) clearance from penetration, sloped to shed water.
   3. Structural Steel Tubing: If corner radii are greater than 1/4 inch (6 mm) and longest side of tube does not exceed 12 inches (305 mm), flash as for pipes; otherwise, provide a standard curb with flashing.
   4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
   5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F (82 degrees C), protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

## 3.07 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

**3.08 FIELD QUALITY CONTROL**

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

**3.09 CLEANING**

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

**3.10 PROTECTION**

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

**END OF SECTION**

# SECTION 07610
# STANDING SEAM SHEET METAL ROOFING

## PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Factory-formed sheet metal roofing, including flashings and trim.

B. Related Sections: Section(s) related to this section include:

1. Metals: Division 5.
2. Building Insulation: Division 7 Building Insulation Section.
3. Sealants: Division 7 Joint Sealants Section.
4. Section 13121 – Pre-Engineered Building.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM A653/A653M Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
2. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot Dip Process.
3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
4. ASTM D2247 Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
5. ASTM E1680 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
6. ASTM E1646 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
7. ASTM G90 Standard Practice for Performing Accelerated Outdoor Weathering of Non-Metallic Materials Using Concentrated Natural Sunlight.

B. Architectural Aluminum Manufacturers Association (AAMA):

1. AAMA 501.2 Field Check of Metal Curtain Walls for Water Leakage.

1.03 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 or infiltration of water.

1. Air infiltration: Maximum 0.06 cfm per lineal foot (0.33 m3/hr per linear meter) of seam at static pressure of 6.24 psf (3.0 kPa) when tested per ASTM E1680.
2. Water penetration:
   a. No uncontrolled water penetration through the joints at a static pressure of 6.24 psf (3.0 kPa) when tested in accordance with ASTM E1646.

B. Finish Performance Requirements:

1. Color change and fade resistance: No cracking, peeling, blistering or loss of adhesion when tested in accordance with ASTM G23; color change, after removal of surface deposits such as dirt or chalk, maximum 5 NBS units.
2. Humidity resistance: No blistering, peeling or loss of adhesion after 1000 hours testing, in accordance with ASTM D2247.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors and textures.

1. Indicate layout of roofing panels and roof panel sizes, including custom-fabricated roofing panels if indicated;

indicate each item of trim and accessories.

2. Indicate in detailed drawings profile and gauge of interior and exterior sheets, and locations and types of fasteners; indicate locations, gauges, shapes and methods of attachment of roofing panels, trim and accessory items.
3. Indicate products/materials required for construction activities of this section not supplied by manufacturer of products of this section.

C. Samples: Submit selection and verification samples for finishes, colors and textures.
1. Selection Samples: For each product requiring color selection, 2 sets of manufacturer's sample chips representing full range of colors and finishes available.
2. Verification Samples: For each color and finish selected, 2 chips indicating match to selected color and finish.

D. Quality Assurance Submittals: Submit the following:
1. Contractor Certificates: Contractor's certification that:
a. Manufacturer of products of this section meets specified qualifications.
b. Installer of products of this section meets specified qualifications.
2. Manufacturer Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions.
4. Manufacturer's Field Reports: Manufacturer's field reports if required.

E. Closeout Submittals: Submit the following:
1. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project. Certificate: When requested, submit certificate indicating qualification.

B. Sheet Metal Industry Standard: Comply with Sheet Metal and Air Conditioning Contractors National Association (SMACNA) Architectural Sheet Metal Manual.

C. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.
1. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 label where appropriate.

C. Packing, Shipping, Handling and Unloading:
1. Bundle roofing panels in waterproof wrapping paper.
2. Package trim and accessories in waterproof wrapping paper.

D. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above-ground location.
1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting. Elevate one end of each skid to allow for moisture runoff.
2. Store products of this section in manufacturer's unopened packaging until installation of products.
3. Maintain dry, heated storage area for products of this section until installation of products.

1.07 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, a sample of manufacturer's standard warranty document.

1. Warranty Period: 15 years commencing on Date of Substantial Completion.

**PART 2 PRODUCTS**

2.01 SHEET METAL ROOFING

A. Basis of Design: McElroy Metal, Maxima 2" ADV mechanically seamed metal roof panel system.

1. McElroy Metal, Inc , 1500 Hamilton Rd., Bossier City, LA 71111; Telephone: (318) 747-8097; Fax: (318) 747-8099; E-mail: **info@mcelroymetal.com; website:** www.mcelroymetal.com.

2. Other equivalent panels by Firestone and Berridge and possibly others that meet the panel specifications, including profiles, texture and finish colors available, may be considered upon submissions, review and approval per Section 01600 – Product Requirements.

a. Firestone Building Products, 250 West 96th Street, Indianapolis, IN 46260, 1-800-428-4442, (317) 575-7000.

b. Berridge Manufacturing Co., 6515 Fratt Road, San Antonio, Texas 78218, 1-800-669-0009; info@berridge.com.

2.02 MANUFACTURED UNITS

A. McElroy Metal Maxima Panels:

1. Profile: Vertical leg standing seam panel with male/female seams to be mechanically interlocked at jobsite with mechanical seamer specifically designed for Maxima profile.

2. Size: 2" high seam by 16" width (51 x 406 mm. Panels in continuous lengths.

3. Panel Surface: 2": Bead/pencil ribs.

Material: Galvalume steel sheet conforming to ASTM A792, AZ50 coating for painted; 24 gauge sheet thickness..

4. Finish: "KYNAR 500" PVDF, Polyvinylidene fluoride color coat, minimum 70% polyvinylidene fluoride resin content, applied to sight-exposed face of sheet after pretreatment and priming in accordance with coating manufacturer's recommendations.

a. Color: Selected from full range of manufacturer's standard colors.

B. Trim:

1. Manufacturer's standard sheet metal matching panel material and finish, break-formed to profiles indicated on drawings and including but not limited to:

a. Copings.

b. Gravel stops.

c. Gutters and downspouts.

d. Termination and transition strips.

1) Color selected from full range of manufacturer's standard colors.

C. Clips and Fasteners: Supply items required for installation of panels in accordance with manufacturer's installation instructions and other indicated items; supply galvanized clips and fasteners.

2.03 MATERIALS

A. Aluminum Sheet: ASTM B209, aluminum and aluminum alloy 3105 with H14 temper in accord with manufacturer's standard to suit forming operations and finish specified.

B. Galvanized Steel Sheet: ASTM A653, G90 steel sheet, zinc coated (galvanized) by hot dip process, structural quality.

2.04 RELATED MATERIALS

A. General: Coordinate use of related materials:

1. Underlayment: Refer to Division 7 Roofing Section.
2. Plywood Deck: Refer to Division 6 Rough Carpentry Section.
3. Sealants: Refer to Division 7 Joint Sealants Section.

2.05 SOURCE QUALITY

A. Source Quality: Obtain metal panel products from a single manufacturer.

**PART 3 EXECUTION**

3.01 SUBSTITUTIONS:

A. Will not be considered if product does not offer the same or very similar options, as determined by the Architect, that match specified product features including, but not limited to material profile, finish, color, texture, pattern, etc. where applicable.

3.02 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installation instructions for substrate verification, preparation requirements and installation.

1. Strippable Film: Remove manufacturer's protective film, if any, from surfaces of roofing panels.

3.03 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

1. Verification of Conditions:
   a. Panel support systems are ready for construction activities of this section and within specified tolerances.
   b. Rough-in utilities are in correct locations.
2. Installer's Examination:
   a. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.
   b. Transmit 2 copies of installer's report to Architect within 24 hours of receipt.
   c. Delay construction activities of this section until unacceptable conditions have been corrected.
   d. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.04 PREPARATION

A. Coordination: Coordinate metal roofing with other work, drainage, flashing and trim, deck substrates, parapets, copings, walls, and other adjoining work to provide a noncorrosive and leak-proof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals.

3.05 INSTALLATION

A. General: Install metal roofing panels to profiles, patterns and drainage indicated and required for leak-proof installation. Provide for structural and thermal movement of work. Seal joints for leak-proof installation.

1. Seams: Provide uniform, neat seams.
2. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leak-proof installation.
3. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for sealant installation.

B. Roofing Installation:

1. Install roofing plumb, true and in correct alignment with structural framing, in accordance with shop drawings and manufacturer's printed installation instructions.
2. Install roofing using manufacturer's concealed fastening system or non-corroding fasteners color-matched to panel.
3. Install trim using concealed fasteners where possible; sight-exposed non-corroding fasteners color-matched to trim are permitted on vertical surfaces only.
4. Install roofing panels in "continuous" (no end laps) lengths.

C. Installation Tolerances:

1. Variation from Plumb: Maximum 1/8" (3.2 mm) in 20 feet (6.096 m).
2. Variation from Level: Maximum 1/8" (3.2 mm) in 20 feet (6.096 m).
3. Variation from True Plane: Maximum 1/8" (3.2 mm) in 20 feet (6.096 m).

3.06 FIELD QUALITY REQUIREMENTS

A. Site Tests (Post-Installation Testing): Owner reserves right to perform post-installation testing of installed metal panel installation.

B. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

3.07 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

1. Remove strippable coating and perform dry wipe-down cleaning of panels as erected.

3.08 PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction:

1. Protect installed products from damage by subsequent construction activities.
2. Replace products having damage other than minor finish damage.
3. Repair products having minor damage to finish in accordance with panel manufacturer's recommendations.
4. Architect shall be sole judge of acceptability of repair to damaged finishes; replace products having rejected repairs.

**END OF SECTION**

Rev. 1/11

# SECTION 07620
# SHEET METAL FLASHING AND TRIM

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Flashings, counterflashings, and fabricated sheet metal items.

B. Reglets and accessories.

### 1.2 REFERENCES:

A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process; 1997.

B. ASTM B 32 - Standard Specification for Solder Metal; 1996.

C. ASTM B 208 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 1996.

D. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 1995.

E. ASTM D 4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 1993.

F. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant; Federal Specifications and Standards; Revision B, 1985.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractor's National Association; 1993, Fifth Edition.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 12 x 12 inch in size illustrating metal finish color.

### 1.4 QUALITY ASSURANCE:

A. Perform word in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

### 1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store, protect and handle products to project site under provisions of Section 01600.

B. Stack materials to prevent twisting, bending or abrasion, and to provide ventilation. Slope metal sheets to endure drainage.

C. Prevent contact with materials which may cause discoloration or staining

## PART 2 - PRODUCTS

### 2.1 SHEET MATERIALS:

A. Pre-finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; 0.02 inch core steel, shop pre-coated with modified silicone coating of color as selected.

### 2.2 ACCESSORIES:

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Protective Backing Paint: Zinc chromate alkyd.

D. Plastic Cement: ASTM D 4586, Type I.

### 2.3 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. Hem exposed edges on underside ½ inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

## PART 3 - EXECUTION

### 3.1 PREPARATION:

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

### 3.2 INSTALLATION:

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

**END OF SECTION**

# SECTION 07711
# GUTTER & DOWNSPOUT SYSTEM

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Pre-finished Commercial Aluminum Gutter and Downspout System.

### 1.2 RELATED SECTIONS:

A. The provisions included under Division1, General Requirements, are included as part of this section as though bound herein.

### 1.3 SUMMARY:

A. Provide labor, material and equipment necessary for furnishing a complete installation of commercial gutter and downspout system.

B. Related Work Specified Elsewhere:
1. Division 5 sections for support framing
2. Division 6 sections for nailers and support framing
3. Division 7 sections for related roofing materials
4. Division 13 sections for pre-engineered metal building systems

### 1.4 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Each type of product specified. Submit manufacturer's detailed technical product data, installation instructions and recommendations, dimensions of individual components, profiles and finishes.

C. Shop Drawings: Show fabrication and installation of commercial gutter and downspout system including fully dimensioned roof plans, expansion joint locations, sections and details of components and other related trims.

D. Finish and Color Selection: Furnish manufacturer's technical data for specified finish and color chart showing full range of colors available.

### 1.5 QUALITY ASSURANCE:

A. Where pre-engineered manufactured products are specified, other field fabricated or shop/field fabricated substitutions will not be accepted. However, where shop/field fabrications are indicated pre-engineered systems will be considered with Architect approval.

B. Obtain all components and related accessories from one single source manufacturer.

C. Follow manufacturer's printed instructions for installing commercial gutter and downspout system. Follow primary roofing manufacturer's printed instructions for installing associated roof material for flashing gutter system to roof.

### 1.6 DELIVERY, STORAGE AND PROTECTION:

A. Deliver, store, protect and handle products to project site under provisions of Section 01600.

B. All products delivered shall be stored in a clean dry location prior to installation.

C. Products furnished with strippable protective masking shall not be exposed to direct sunlight for more than 30 minutes without removing masking.

D. Do not install finished materials with scars or abrasions.

**1.7 PROJECT CONDITIONS:**

A. Coordinate work of this Section with adjoining work for proper sequencing to ensure protection from inclimate weather and to protect materials and their finish against damage.

B. Do not install commercial gutter and downspout system during inclimate weather. When installing in cold climates warm adhesives and caulks to at least 50 degrees F. prior to application.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

A. Provide commercial gutter system, accessories and drainware as manufactured by Perimeter Systems, a division of Southern Aluminum Finishing Company; 216 Hawkins Ave., Suite 218; Sanford, NC 27330; Phone: (800) 334-9823.

B. Substitutions: See Section 01600 - Product Requirements.

**2.2 TYPE:**

A. Provide Perimeter System Designer Series Commercial Gutter System "Roman" Profile, 6" size, Model #DSR-6.

**2.3 MATERIALS & FABRICATION:**

A. Concealed Gutter liner shall be manufactured from 0.040" mill finished aluminum in 10'-0" lengths. Liner shall be:
1. Factory notched to receive brackets and straps.
2. Manufactured with 1" telescoping and notched end laps.
3. Factory punched with fastening holes elongated to allow for thermal movement.

B. Support brackets and retainer stem shall be manufactured from 0.125" x 1.00" extruded aluminum bar, helliarc welded construction, factory punched for fasteners.

C. Interior Straps shall be manufactured from 0.125" x 1.00" extruded aluminum.

D. Roman Profile, snap-on fascia, shall be manufactured from 0.040" aluminum, 10'-0" lengths. Fascias shall be press formed with radius dies on a CNC Press to provide repeated true and accurate profiles.

E. Fascia splices shall be manufactured from 0.040" aluminum, 6" lengths, formed to fit the inside of the snap-on fascia.

**2.4 ACCESSORIES:**

A. Mitered corners, provide factory mitered corners for both fascia and liner. Fascia profiles shall be

precision saw cut, helliarc tack welded to produce a picture frame joint. Concealed liner miter shall be precision saw cut with a continuous helliarc weld water-tight joint.

B. Sculptured end caps, provide factory mitered end caps for fascia. Fascia profiles shall be precision saw cut, helliarc tack welded to produce a picture frame joint.

C. Cornice returns, if shown on drawings, provide Roman Cornice Returns as gutter terminations in lengths as indicated on plans.

D. Provide rake trim to match and continue gutter profiles at all roof rake edges. Provide rake factory trim, precision saw cut, helliarc tack welded to produce a picture frame joint.

E. Liner End Caps, provide mill finished aluminum liner end caps at all fascia end caps and wall abutments.

F. Liner Expansion Joint, provide manufacturer's elastomeric expansion joints at 40' intervals or as shown on shop drawings.

**2.5 DRAINWARE:**

A. Downspout and Elbows: provide downspout Model #DS-FM, 4" depth x 6" width, at locations as indicated on plans. Downspouts shall be manufactured from 0.090" aluminum finished to match gutter fascia. Downspout elbows shall have helliarc welded joints.

B. Outlets, at all locations provide aluminum outlets to connect liner to downspout.

C. Wall brackets, provide Style 1. Wall brackets at 60" maximum spacing (minimum 2 brackets). Brackets shall be manufactured from 0.125" x 1.00" extruded aluminum bar, finsihed to match downspout.

D. Downspout outlets to terminate into subdrainage piping system - See Civil Engineering drawings and specification sections.

**2.6 FINISHES:**

A. General: Apply coatings to exposed aluminum components after fabrication for maximum coating performance and to prevent crazing, abrasion, and damage to finished surfaces..

B. Pre-Treatment: Aluminum components shall be pre-treated with solutions to remove organic and inorganic surface soils, remove residual oxides, followed by a chrome phosphate conversion cating to which organic coatings will firmly adhere.

C. Coating Type: High performance coating, two-coat, shop applied, 70% Polyvinylidene Fluoride (PVDF) coating based on Elf Atochem, Inc. - Kynar 500 or Ausimont USA, Inc - Hylar 5000 resin, meeting AAMA 2605 specifications.

D. Color: to be selected from manufacturer's full range of 56 EZ Mix colors.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. The installer must examine substrates and conditions under which commercial gutter system will be installed. All wood plates and/or fascia boards shall be installed true, straight, and free of splits,

cracks or other irregularities. Do not proceed with installation until unsatisfactory conditions are corrected.

**3.2 PREPARATION:**

A. Installer shall thoroughly read and follow manufacturer's installation instructions before proceeding with installation..

B. Prior to the installation of the commercial gutter system, soffits, extenders and associated cornice profiles shall be installed.

**3.3 INSTALLATION:**

A. General: The commercial gutter system shall be installed in strict accordance with manufacturer's printed instructions. Deviations from the instructions are not allowed.

B. Support Brackets: Layout support brackets to provide ½" slope in 40 linear feet. Install mounting brackets with #10 x 2" stainless steel wood screws.

C. Liner: Install concealed gutter liner onto support brackets and fasten to substrates with 1-1/2" aluminum or stainless steel nails. Rivet and seal liner joints with high grade exterior sealant as recommended by gutter manufacturer.

D. Expansion Joints: Install elastomeric expansion joints as shown on plans and/or shop drawings. Maximum expansion joint spacing shall be 40' centers.

E. Locate and install downspouts before proceeding with fascia installation. Coordinate downspout locations with drawings and with locations of subdrainage piping system per civil engineering drawings.

F. Install fascia with concealed splice plates over support brackets and liner. Coordinate and align spacing of joints with associated trims if applicable. Plan spacing of joints so there are no sections of fascia shorter than 48" in length. Check horizontal alignment of cornice during installation and adjust as required. At downspout locations, neatly cut fascia to accommodate downspout.

G. Install interior straps by fully engaging them into liner and fascia. Complete by securely riveting.

**END OF SECTION**

SECTION 07723

ROOF HATCH AND LADDER SAFETY POST

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Work Included: Provide factory-fabricated roof hatches for ladder access and ladder safety posts.

### 1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data.

B. Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.

C. Warranty: Submit executed copy of manufacturer's standard warranty.

### 1.3 QUALITY ASSURANCE

A. Manufacturer: A minimum of 5 years experience manufacturing similar products.

B. Installer: A minimum of 2 years experience installing similar products.

C. Manufacturer's Quality System: Registered to ISO 9001:2008 Quality Standards including in-house engineering for product design activities.

### 1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

### 1.5 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Type S-50TB Roof Hatch and Type LU Ladder Safety Post by The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-800-366-6530, Fax: 1-203-933-8478, Web: www.bilco.com.

## 2.2 ROOF HATCH

A. Furnish and install where indicated on plans metal roof hatch Type S-50TB, size width: 36" (914mm) x length: 30" (762mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.

B. Performance characteristics:

1. Cover and curb shall be thermally broken to prevent heat transfer between interior and exterior surfaces.
2. Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m$^2$) with a maximum deflection of 1/150th of the span or 20 psf (97kg/m$^2$) wind uplift.
3. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
4. Operation of the cover shall not be affected by temperature.
5. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.

C. Cover: Shall be 11 gauge (2.3mm) aluminum with a 5" (127mm) beaded flange with formed reinforcing members. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. Cover shall have a heavy extruded EPDM rubber gasket bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

D. Cover insulation: Shall be 3" (75mm) thick polyisocyanurate with an R-value = 18 (U=0.315 W/m$^2$K), fully covered and protected by an 18 gauge (1mm) aluminum liner.

E. Curb: Shall be 12" (305mm) in height and of 11 gauge (2.3mm) aluminum. Interior and exterior surfaces shall be thermally broken to minimize heat transfer and to resist condensation. The curb shall be formed with a 5-1/2" (140mm) flange with 7/16" (11mm) holes provided for securing to the roof deck. The curb shall be equipped with an integral metal capflashing of the same gauge and material as the curb, fully welded at the corners, that features the Bil-Clip® flashing system, including stamped tabs, 6" (153mm) on center, to be bent inward to hold single ply roofing membrane securely in place.

F. Curb insulation: Shall be 3" (75mm) thick polyisocyanurate with an R-value = 18 (U=0.315 W/m$^2$K).

G. Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe welded to the curb assembly.

H. Hardware

1. Heavy stainless steel pintle hinges shall be provided
2. Cover shall be equipped with a spring latch with interior and exterior turn handles
3. Roof hatch shall be equipped with interior and exterior padlock hasps.
4. The latch strike shall be a stamped component bolted to the curb assembly.
5. Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1" (25mm) diameter red vinyl grip handle to permit easy release for closing.
6. Compression spring tubes shall be an anti-corrosive composite material and all other hardware shall be zinc plated and chromate sealed. [For installation in highly corrosive environments or when prolonged exposure to hot water or steam is anticipated, specify Type 316 stainless steel hardware].
7. Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

I. Finishes: factory finish shall be mill finish aluminum.

## 2.3 LADDER SAFETY POST

A. Furnish and install where indicated on plans ladder safety post Model LU-1. The ladder safety post shall be pre-assembled from the manufacturer.

B. Performance characteristics:

1. Tubular post shall lock automatically when fully extended.
2. Safety post shall have controlled upward and downward movement.
3. Release lever shall disengage the post to allow it to be returned to its lowered position.
4. Post shall have adjustable mounting brackets to fit ladder rung spacing up to 14" (356mm) on center and clamp brackets to accommodate ladder rungs up to 1-3/4" (44mm) in diameter.

C. Post: Shall be manufactured of high strength square tubing. A pull up loop shall be provided at the upper end of the post to facilitate raising the post.

D. Material of construction: Shall be steel (Model LU-1).

E. Balancing spring: A stainless steel spring balancing mechanism shall be provided to provide smooth, easy, controlled operation when raising and lowering the safety post. [For installation in highly corrosive atmospheres, Model LU-3 incorporates a special alloy spring mechanism].

F. Hardware: All mounting hardware shall be Type 316 stainless steel.

G. Finishes: Factory finish shall be yellow powder coat steel Model LU-1.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.

1. Test units for proper function and adjust until proper operation is achieved.
2. Repair finishes damaged during installation.
3. Restore finishes so no evidence remains of corrective work.

## 3.3 ADJUSTING AND CLEANING

A. Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION

# SECTION 07840
# FIRESTOPPING

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Firestopping materials.

B. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.

### 1.2 REFERENCES:

A. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 1997.

B. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops; 1994b.

C. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories, Inc.; current edition.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance ratings, and limitations.

C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.4 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.

### 1.5 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 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Hevi-Duty/Nelson - Product FSP Firestop.

B. Substitutions: Under provisions of Section 01600 - Product Requirements.

**2.2 MATERIALS:**

A. Firestopping Material: Single component formulated compound mixed with incombustible non-asbestos fibers; conforming to the following:
   1. Elongation: 180 percent minimum.
   2. Density: .049 lb/cu ft.

B. Primers, Sleeves, Forms and Accessories: Type required for tested assembly design.

**2.3 ACCESSORIES:**

A. Dam Material: Ceramic Fiberboard.

B. Retainers: Bolt clips to support fiberboard.

**2.4 FINISHES:**

A. Color: Tan.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify openings are ready to receive the work of this section.

**3.2 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.

**3.3 INSTALLATION:**

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Install labeling required by code.

**3.4 CLEANING AND PROTECTION:**

A. Clean adjacent surfaces of firestopping materials.

B. Protect adjacent surfaces from damage by material installation.

**END OF SECTION**

# SECTION 07900
# JOINT SEALERS

## PART 1 – GENERAL

1.1 REFERENCE STANDARDS:

A. **ASTM C1193 - Standard Guide for Use of Joint Sealants;** 2013.

1.2 SUBMITTALS:

A. See Section 013000 - **Administrative** Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.
5. Substrates for which use of primer is required
6. Substrates for which laboratory adhesion and/or compatibility testing is required.
7. Installation instructions, including precautions, limitations, and recommended backing materials and tools
8. Sample product warranty
9. Certification by manufacturer indicating that product complies with specification requirements.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant co for is not specified, submit manufacturer's color cards showing standard colors available for selection

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect Engineer and submit at least two physical samples for verification of color of each required sealant.

F. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation as specified in Section 01600

G. Installation Plan: Submit at least four weeks prior to start of installation.

H. Installation Log: Submit filled out log for each length or instance of sealant installed.

1.3 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience and approved by manufacturer.

C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories
1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver to manufacturer sufficient samples for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

D. Installation Plan: Include schedule of sealed joints, including the following.
1. Installation Log Form: Include the following data fields, with known information filled out.
a. Date of installation
b. Name of installer.
c. Actual joint width ; provide space to indicate maximum and minimum width
d. Actual joint depth to face of backing material at centerline of joint.
e. Air temperature.

1.4 WARRANTY:

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a two year period after date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion oi cohesion, or do not cure

**PART 2 – PRODUCTS**

2.01 JOINT SEALANT APPLIC ATIONS:

A. Wall expansion and control joints.
1. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items
2. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
3. .Joints where installation of sealant is specified in another section.

B. Floor Joints in Wet Areas: Nonsag polyurethane "nontraffic-grade" sealant suitable for continuous liquid immersion.

2.2 JOINT SEALANTS – GENERAL:

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in South Coast Air Quality Management District (SCAQMD); Rule 1168

B. Colors for Flooring: Match adjacent concrete floorings.

2.3 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in

accordance with ASTM C1248.

3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Color: Match adjacent finished surfaces.
5. Cure Type: Single-component, neutral moisture curing

2.4 ACCESSORIES:

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining. PART 3

**PART 3 – EXECUTION**

3.1 EXAMINATION:

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.2 PREPARATION:

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions

C. Perform preparation in accordance with manufacturer's instructions and /ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable,

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.3 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 ASI M C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension,

and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot fee used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

**END OF SECTION**

# SECTION 08111
# STANDARD STEEL DOORS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Non-rated steel doors.

B. Thermally insulated steel doors.

### 1.2 REFERENCES:

A. ANSI/CABO A117.1 - American Standard for Buildings and Facilities - Providing accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.

B. ASTM B C 236 - Standard Test Method for Steady-State Thermal Performance of Building Assemblies by Means of a Guarded Hot Box; 1989; (Re-approved 1993).

C. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1998 (ANSI/SDI-100).

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate door configurations; location of cut-outs for hardware reinforcement.

C. Manufacturer's Installation Instructions: Indicate special procedures.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.4 QUALITY ASSURANCE:

A. Conform to requirements of SDI 100 and ANSI A117.1.

B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### 1.5 DELIVERY, STORAGE, AND PROTECTION:

A. Protect doors with resilient packaging sealed with heat shrunk plastic.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Break seal on site to permit ventilation.

### 1.6 PROJECT CONDITIONS:

A. Coordinate the work with door opening construction, door frame, and door hardware installation.

B. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

## PART 2 - PRODUCTS

**2.1 MANUFACTURERS:**

A. Ceco.

B. Republic.

C. Steelcraft.

D. Substitutions: See Section 01600 - Product Requirements.

**2.2 DOORS:**

A. Exterior Doors (Thermally Isolated): SDI 100, Grade II, Model 2.

**2.3 DOOR CONSTRUCTION:**

A. Face: Steel sheet in accordance with SDI 100.

B. End Closure: Channel, 0.047 inches thick, flush.

C. Core: Polyurethane.

D. Thermal Insulated Doors: Total insulation R value of 15, measured in accordance with ASTM C 236.

**2.4 FABRICATION:**

A. Fabricate doors with hardware reinforcement welded in place.

B. Configure exterior doors with special profile to receive recessed weatherstripping.

**2.5 FINISH:**

A. Primer: Baked.

B. Paint: Color as specified in Section 00860 - Color Schedule.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

**3.2 INSTALLATION:**

A. Install doors in accordance with SDI 100.

B. Coordinate installation of glass and glazing.

C. Coordinate installation of doors with installation of frames specified in Section 08112 and hardware specified in Section 08710.

**3.3 ERECTION TOLERANCES:**

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

**3.4 ADJUSTING:**

A. Adjust doors for smooth and balanced door movement.

**END OF SECTION**

# SECTION 08112
# STANDARD STEEL FRAMES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Non-rated and fire-rated steel frames for doors and interior windows.

B. Thermally insulated steel frames.

### 1.2 REFERENCES:

A. ANSI/CABO A117.1 - American Standard for Buildings and Facilities - Providing accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.

B. DHI A 115 Series - Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition (ANSI/DHI 115 Series).

C. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.

D. NFPA 252 - Standard Methods for Fire Tests of Door Assemblies; National Fire Protection Association; 1995.

E. SDI 100 - Recommended Specifications Standard Steel Doors and Frames; Steel Door Institute; 1998 (ANSI/SDI-100).

F. UL (BMD) - Building Materials Directory; Underwriter's Laboratories Inc.; current edition.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Indicate frame configuration and finishes.

C. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacings, location of cut-outs for hardware, and finish.

D. Manufacturer's Installation Instructions: Indicate special installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

### 1.4 QUALITY ASSURANCE:

A. Conform to requirements of SDI 100 and ANSI A117.1.

B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### 1.5 REGULATORY REQUIREMENTS:

A. Fire Rated Frame Construction: Conform to NFPA 252.

B. Installed Frame Assembly: Conform to NFPA 80 for fire rated class same as fire door.

### 1.6 DELIVERY, STORAGE, AND PROTECTION:

A. Accept frames on site in manufacturer's packaging. Inspect for damage.

**1.7 PROJECT CONDITIONS:**

A. Coordinate the work with frame opening construction, door and hardware installation.

B. Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

A. Ceco.

B. Curries.

C. Steelcraft.

D. Substitutions: See Section 01600 - Product Requirements.

**2.2 FRAMES:**

A. Interior Frames:
1. 18 gauge thick material; base metal thickness,

**2.3 ACCESSORIES:**

A. Removable Stops: Rolled steel channel shape, mitered corners; prepared for counter sink style tamper proof screws.

B. Primer: Zinc chromate type.

C. Silencers: Resilient rubber fitted into drilled hole.

D. Anchors: Minimum of 8 per frame including floor base "floor" anchor.

**2.4 FABRICATION:**

A. Fabricate frames as welded unit.

B. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.

C. Reinforce frames wider than 48 inches with roll formed steel channels fitted lightly into frame head, flush with top.

D. Attach fire rated label to each fire rated door unit.

**2.5 FINISH:**

A. Primer: Baked.

B. Paint: Color as specified in Section 00860 - Color Schedule.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

### 3.2 INSTALLATION:

A. Install frames in accordance with SDI 100.

B. Coordinate installation of glass and glazing.

C. Coordinate installation of frames with installation of hardware specified in Section 08112 and hardware specified in Section 08710.

D. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

E. Install frames with minimum of 8 anchors per frame including base "floor" anchor.

### 3.3 ERECTION TOLERANCES:

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, crossed corner to corner.

### 3.4 SCHEDULE - SEE DRAWINGS

**END OF SECTION**

# SECTION 08211
# FLUSH WOOD DOORS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Flush wood doors; flush and flush glazed configuration ; fire rated and non-rated.

### 1.2 REFERENCES:

A. AHA A 135.4 - Basic Hardboard; American Hardboard Association; 1995.

B. AWI P-200 - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.

C. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association; 1995.

D. UL (BMD) - Building Materials Directory; Underwriter's Laboratories Inc.; current edition.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory finishing criteria, identify cutouts for glazing.

D. Samples: Submit two samples of door veneer, 4 x 6 inch in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

### 1.4 QUALITY ASSURANCE:

A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Premium Grade.

B. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### 1.5 REGULATORY REQUIREMENTS:

A. Fire Door Construction: Conform to NFPA 252.
   1. Listed and classified by UL as suitable for the purpose specified and indicated.

B. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated.

### 1.6 DELIVERY, STORAGE, AND PROTECTION:

A. Package, deliver and store doors in accordance with AWI P-200, Section 1300.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

**1.7 PROJECT CONDITIONS:**

A. Coordinate the work with door opening construction, door and hardware installation.

**1.8 WARRANTY:**

A. See Section 01780 - Closeout Submittals for additional warranty requirements.

B. Provide warranty for the following term:
1. Interior doors: Life of installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

A. Weyerhauser. (Now known as Marshfield).

B. Algoma.

C. Eggers.

D. No Substitutions allowed unless approved prior to bidding.

**2.2 DOOR TYPES:**

A. Flush Interior Doors: 1-3/4 inches thick, solid core construction.

**2.3 DOOR CORES:**

A. Non-Rated Solid Core and 20 minute Rated Doors: AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Type PC - Particleboard.

B. Fire Rated Doors: AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Type FD 1-1/2.

**2.4 DOOR FACINGS:**

A. Interior Doors - Veneer: Premium grade wood veneer, red oak species, plain sliced, with book matched grain, for transparent finish.
1. Maximum number of flitches per door to be four.

**2.5 ACCESSORIES:**

A. Glazing Stops: Wood, of same species as door facing, butted corners, prepared for countersink style tamper proof screws.

**2.6 FABRICATION:**

A. Fabricate doors in accordance with AWI Quality Standards requirements.

B. Fabricate fire rated doors in accordance with UL requirements. Attach fire rating label to door.

C. Provide solid blocks at lock edge for hardware reinforcement.

D. Vertical Exposed Edge of Stiles - Veneer Faces: of same species as veneer facing.

E. Fit door edge trim to edge of stiles after applying veneer facing.

F. Bond edge banding to cores.

G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

H. Factory fit doors for frame opening dimensions identified on shop drawings.

I. Provide edge clearances in accordance with AWI 1600.

**2.7 FINISH:**

A. Stain: As specified in Section 00860 - Color Schedule.

B. Seal door top edge with stain sealer to match door facing. Seal bottom of doors.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

**3.2 INSTALLATION:**

A. Install doors in accordance with manufacturer's instructions and AWI P-200 requirements.
1. Install fire rated doors in accordance with NFPA 80 requirements.

B. Trim non-rated door width by cutting equally on both jamb edges.

C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
1. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

D. Machine cut for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

G. Install door louvers plumb and level.

**3.3 INSTALLATION TOLERANCES:**

A. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 x 84 inch surface area.

B. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 x 84 inch surface area.

C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 x 84 inch surface area.

**3.4 ADJUSTING:**

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

**3.5 SCHEDULE - SEE DRAWINGS**

**END OF SECTION**

# SECTION 08330
# OVERHEAD COILING SERVICE DOORS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES:

A. Overhead coiling sheet doors.
   1. Three (3) doors 8' wide x 10' high.

### 1.2 RELATED SECTIONS:

A. Section 05500 - Metal Fabrications: Support framing and framed opening.

B. Section 06200 - Finish Carpentry: Wood jamb and head trim.

C. Section 08710 - Door Hardware: Product Requirements for cylinder core and keys.

D. Section 09900 - Painting: Field applied finish.

### 1.3 REFERENCES:

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

B. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

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

### 1.4 DESIGN / PERFORMANCE REQUIREMENTS:

A. Overhead coiling sheet doors:
   1. Wind Loads: Design door assembly for Series 790 doors to withstand wind/suction load of 25/37.5 psf (1197/1796 Pa) without damage to door or assembly components.
   2. Operation: Design door assembly to operate for not less than 10,000 cycles.

B. Single-Source Responsibility: Provide doors, tracks, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

### 1.5 SUBMITTALS:

A. Submit under provisions of Section 01300.

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. Details of construction and fabrication.
   4. Installation instructions.

C. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

**1.6 QUALITY ASSURANCE:**

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience in the fabrication and installation of security closures.

B. Installer Qualifications: Installer Qualifications: Company specializing in performing Work of this section with minimum three years and approved by manufacturer.

**1.7 DELIVERY, STORAGE, AND HANDLING:**

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

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

**1.8 PROJECT CONDITIONS:**

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

**1.9 COORDINATION:**

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS:**

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

**2.2 OVERHEAD COILING SHEET DOORS:**

A. Overhead Coiling Commercial Windloaded Sheet Doors: Overhead Door Corporation 790 Series.
   1. Curtain: Roll formed, 26 gauge galvanized steel, per ASTM A 653, SQ Grade 80, Galvanized G-30. Sections interlocked and permanently seamed together to form a continuous curtain. Provided with a PVC edge strip stapled on the edge of curtain's exterior side to minimize steel-to-steel contact, enhance door operation, and minimize curtain nesting and scratching. Curtain shall have 9 gauge ductile iron windlocks on each edge of the curtain spaced according to door size and the application's windloading requirements.
   2. Finish:
      a. Curtain slats shall receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
      b. Top Coat Color:
         1) PowderGuard Finish:
            (a) Exterior: Gray – color to be selected
            (b) Interior: White – color to be selected
      c. Guides, angles, bottom bar stops, headplates and rings galvanized. Aluminum bottom bar clear anodized.
   3. Bottom Bar: Extruded aluminum reinforced with 1-1/2 inch by 2 inch (38 mm by 51 mm) roll formed steel angle and provided with a flexible PVC bulb type astragal to ensure a consistent seal along the floor. Extrusion designed to interlock with door curtain.
   4. Bottom Bar Stops: Bottom bar stops of "quick connect" design that allows the curtain to be inserted into the "universal" guide and lock into place with one fastener. Bottom bar stops shall be 12 gauge.
   5. Guides: Guides roll-formed from 14-gauge grade 50 galvanized steel. Guides 3 inches (76 mm) wide with UHMW polypropylene rub strips on each edge of the guide. Through hole, universal design shall allow easy access from the front of the guide for fastener attachment to the door jamb material. Guides of universal design for use in concrete, wood, steel or masonry jambs Guides pre-punched to accept "quick connect" attachment of the bottom bar stops.
   6. Heavy Duty Headplates: 0.187 inch (4.76 mm) thick welded steel, mounted directly to the wall to support the door shaft and ensure smooth door roll operation.
   7. Counterbalance: Counterbalance assembly with "stepped" steel rings designed to ensure a tight and uniform curtain wrap. Rings include steel roller bearings for enhanced door operation and cycle life. 3-3/8 inch (86 mm) I.D. springs lubricated at factory to enhance long life and door operation. Shaft 1-5/16 inch (35 mm) diameter to minimize door deflection. Counterbalance assembly design to allow quick assembly of "non-handed" chain hoist on either side of door on the job site.
   8. Manual Operation:
      a. Manual push up.
   9. Locking:
      a. Optional Dual exterior curtain locks, 770 series slide bolt lock.bar assembly.
      b. Doors to be locked from exterior side only.

## PART 3 EXECUTION

### 3.1 EXAMINATION:

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

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

**3.2 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.

3.3 **INSTALLATION**:

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

F. Install perimeter trim and closures.

G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

**3.4 ADJUSTING:**

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

**3.5 CLEANING:**

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

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

**3.6 PROTECTION:**

A. Protect installed products until completion of project.

END OF SECTION

# SECTION 08341
# VERTICAL "LIFT STRAP" BI-FOLD HANGER DOOR

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. One (1) Custom designed and constructed, vertical "lift strap" bi-fold hanger

B. Electric operators and controls.

C. Operating hardware tracks, support and accessories.

### 1.2 RELATED WORK:

A. Section 03300 - Cast In Place Concrete

B. Section 05500 - Metal Fabrications

C. Section 06114 - Wood Blocking and Curbing

D. Section 07900 - Joint Sealers

E. Section 08452 - Insulated Translucent Fiberglass Sandwich Panel Unit Wall System

F. Section 09900 - Painting and Coatings

G. Division 16 - Electrical

### 1.3 REFERENCES:

A. 2012 Arkansas Fire Prevention Code (Based on IBC 2012 Edition with Arkansas Amendments).

### 1.4 DESIGN/PERFORMANCE REQUIREMENTS:

A. The door shall be engineered to resist all anticipated loads without sagging, bowing or conflicting with its smooth and efficient operation.

B. Wind Loads: Design and size components for windload as required by the 2012 AFPC.
   1. Wind load: See Structural Drawings
   2. Exposure: See Structural Drawings

C. Electrical Power and wiring connections to meet all applicable codes. Electrical service to be minimum 30A, 480V, 3-Phase.
   1. Circuit to be sized at minimum 60A, 3-Phase with 60/3 CB

D. Single source responsibility:
   1. Provide all door components, framing, tracks, motors, straps, accessories, etc. from one manufacturer.
   2. Provide secondary components from source acceptable to manufacturer of primary components.

### 1.5 SUBMITTALS:

A. Submit under provisions of Section 01300.

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: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

**1.6 QUALITY ASSURANCE:**

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

**1.7 DELIVERY, STORAGE, AND HANDLING:**

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

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

**1.8 PROJECT CONDITIONS:**

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

**1.9 WARRANTY:**

A. Provide manufacturer's door and operators system warranty.

**PART 2 - PRODUCT**

**2.1 MANUFACTURER:**

A. Door to be manufactured by Schweiss Worldwide Door Sales, 72121 470th St. Hector, MN 55342, schweiss@schweisdoors.com; Phone: 507-426-8273; 800-746-8273.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

**2.2 VERTICAL (UPWARD ACTING) "LIFT STRAP" HANGER DOOR:**

A. Door for this project will consist of one (1) vertical "lift strap" bi-fold door

1. With exterior insulated translucent fiberglass sandwich panel unit wall system by others. See Section 08452.

B. Hanger door with door in up position, shall have a minimum clear opening width of 50'-0" as shown in the plans and a minimum clear height of 18'-0" above finished floor elevation.

C. Door shall be mounted flush with exterior walls of building.

D. The design shall be furnished, approved and sealed by a professional engineer registered in the state where the project is located.

E. The building header shall be designed to accommodate horizontal and vertical building deflections to support the bi-fold door in all positions (with the proper lateral bracing).

F. The building's door columns shall be framed of the proper design and size to reinforce the opening (with lateral bracing) and to carry all loads and vibrations imposed thereon.

G. The bi-fold door should have solid footing with sill directly underneath the door frame and extending outward from the door to provide a base for the door's weather seal. This also prevents flow of water into, or under the door installation.

H. The finished floor of the building should be designed to prevent flow of water under the door installation. Sills shall have a slight slope outward of the bi-fold door to prevent water flow under the door installation.

I. The building contractor shall furnish and install a pre-wired electrical door operating mechanism to control the bi-fold door.

J. The contractor is responsible and required to completely install the pre-wired electrical door operating mechanism, push button controls, devices and electrical conduit and wiring to the door operating controls.

K. Control panel with up/down/off switch pre-wired to motor, and over-ride controls with the required number of adequately sized insulated electrical conductors.

L. All electrical controls and devices shall conform to the requirements of the current National Electrical Code 513, NEMA and the UL approved.

M. The operator is furnished complete details, consisting of a motor and factory-wired control panels consisting of main-fused disconnect switch, magnetic reversing starters, limit switches and push button controls, control circuit transformers, relays, timing devices, and warning devices.

N. Lift Straps
1. The door power unit shall be operated by a system of lifting straps (not cables) lifting drums and driveshifts.
2. The lift straps shall have adjustable slack take-up device to keep proper tension on each lift strap.
3. The lift drum must be properly shielded to avoid any potential hazards to people.
4. Lift straps and lift drums shall be manufacturer's standard adequately sized insufficient amount to give 5:1 safety factor.

## 2.3 MATERIALS AND ACCESSORIES:

A. Door framework constructed of heavy steel tubing with internal truss designed for extra strength on interior side of door frame.

B. Heavy duty hinges.

C. Wind pins

D. All door frame members and parts carefully prepared for painting and finished with gray primer for field painting.

E. Top Drive Power Unit.

F. Accessories include:
1. Top over-ride jiggle switches/side latch jiggle switches.
2. Electric photo eye-sensor
3. Three button constant hold control station dead man at manufacturer's recommendation.
4. Door base safety edge.
5. Warning alert system including entrance lights and horn.
6. Emergency back-up hand crank.
7. Automatic strap/latches - push button
8. Two handheld remote controls with antennas and featuring open/close/stop buttons (must have an auto latching or lock safety switch).
9. Top and bottom rubber seals.
10. Bottom rubber seal shall include optional foam cushion kit and wrap around feature.
11. Column follower at bottom seal.
12. Corner foam cushion seal.
13. Side weather seal kit.

G. Manufacturer to provide all flashings, trim and accessories for a complete watertight installation when door is in fully closed position.

**2.4 DOOR WARRANTY:**

A. Provide manufacturer's warranty including:
1. Minimum of 2 years on materials and workmanship.
2. Minimum of 7 years on original lift straps against defects.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. General Contractor and door manufacturer shall coordinate design manufacturing and installation of bi-fold door with insulated translucent fiberglass sandwich panel unit wall system to be attached to exterior face.

B. Verify existing conditions before starting work.

C. Verify that opening sizes and tolerances are acceptable.

D. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

**3.2 INSTALLATION:**

A. Install doors in accordance with manufacturer's insturctions.

B. Coordinate installation of doors with installation of support framing, frames, hardware, operators, and existing conditions.

C. Coordinate installation of glazing.

D. Install door plumb and level.

**3.3 INSTALLATION TOLERANCES:**

A. General Contractor to coordinate concrete floor slab detailing with door bottom location.
1. Slope concrete slab floor at bi-fold door opening beginning at interior face of door framing. Verify.

B. Door bottom seals shall not fall over concrete slab joint.

A. Install doors to meet manufacturer's recommended tolerances.

**3.4 ADJUSTING:**

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure

C. Adjust operators for proper control of doors.

**3.5 SCHEDULE - SEE DRAWINGS**

**END OF SECTION**

# SECTION 08360
# SECTIONAL OVERHEAD DOORS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES:

A. Insulated Sectional Overhead Doors.
   1. Four (4) doors 16' wide x 12' high.
   2. Three (3) doors 12' wide x 12' high.

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

### 1.2 RELATED SECTIONS:

A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.

B. Section 05500 - Metal Fabrications: Steel frame and supports.

C. Section 06114 - Wood Blocking and Curbing: Rough wood framing and blocking for door opening.

D. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.

E. Section 08710 - Door Hardware: Cylinder locks.

F. Section 09900 - Paints and Coatings: Field painting.

G. Section 16130 - Raceway and Boxes: Empty conduit from control station to door operator.

H. Section 16150 - Wiring Connections: Electrical service to door operator.

### 1.3 REFERENCES:

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

### 1.4 DESIGN / PERFORMANCE REQUIREMENTS:

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable codes, including Arkansas Fire Prevention Code, 2012 Edition (based on 2012 International Building Code with Arkansas Amendments).

B. Wiring Connections: Requirements for electrical characteristics.
   1. 115 volts, single phase, 60 Hz. – verify with electrical to be provided.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

### 1.5 SUBMITTALS:

A. Submit under provisions of Section 01300.

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: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

**1.6 QUALITY ASSURANCE:**

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

**1.7 DELIVERY, STORAGE, AND HANDLING:**

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

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

**1.8 PROJECT CONDITIONS:**

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

**1.9 WARRANTY:**

A. Warranty: Manufacturer's limited door and operators System warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.

**PART 2 PRODUCTS**

**2.1 MANUFACTURERS:**

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

**2.2 INSULATED SECTIONAL OVERHEAD DOORS:**

A. Insulated Steel Sectional Overhead Doors: 592 Series Thermacore Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:
   1. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.
      a. Panel Thickness: 2 inches (51 mm).
      b. Exterior Surface: Ribbed, textured.
      c. Exterior Steel: .015 inch (.38 mm), hot-dipped galvanized.
      d. End Stiles: 16 gauge with thermal break.
      e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor.
         1) Standard cycle spring: 10,000 cycles.
      f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
      g. Thermal Values: R-value of 17.50; U-value of 0.057.
      h. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
      i. Each door to have three (3) Full Glazed Aluminum Sash sections (refer to drawing elevations):
         1) 1/2 inch (12.5 mm) Low E Insulated glazing.
         2)
   2. Finish and Color:
      a. PowderGuard Finish:
         1) Interior color, white – color to be selected.
         2) Exterior color, gray – color to be selected.
   3. Windload Design: Provide to meet the Design/Performance requirements specified.
   4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
   5. Lock:
      a. Interior mounted slide lock.
   6. Weatherstripping:
      a. EPDM bulb-type strip at bottom section.
      b. Flexible Jamb seals.
      c. Flexible Header seal.
   7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
      a. Size: Provide track size 2" or 3" as recommended by manufacturer for specific usage/application indicated and size of door.
         1) 2 inch (51 mm).
         2) 3 inch (76 mm).
      b. Type: Door tracks to be of lift configuration indicated and include both "standard lift" and "Follow Roof Slope".
         1) Standard lift.
         2) Follow roof slope.
   8. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
      a. Entrapment Protection: Required for momentary contact, includes radio control operation.
         1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.
      b. Operator Controls:
         1) Push-button operated control stations with open, close, and stop buttons.
         2) Surface mounting.
         3) Interior location.
      c. Special Operation:
         1) Pull switch.

## PART 3 EXECUTION

### 3.1 EXAMINATION:

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

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

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

### 3.2 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.

### 3.3 INSTALLATION:

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

### 3.4 CLEANING AND ADJUSTING:

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

### 3.5 PROTECTION:

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

**END OF SECTION**

# SECTION 08411
# ALUMINUM-FRAMED STOREFRONTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Kawneer Architectural Aluminum Storefront Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.
   1. Types of Kawneer Aluminum Storefront Systems include:
      a. Interior Units - Trifab VG 451 Storefront System - 2" x 4-1/2" nominal dimension; Non-thermal; Front, Structural Silicone or Weatherseal Glazed (Type B); Stick Fabrication.
      b. Exterior Units - Trifab VG 451T Storefront System - 2" x 4-1/2" nominal dimension; Thermal; Front, Stick or Punched Opening Fabrication.

### 1.2 RELATED SECTIONS:

A. Section 07900 - Joint Sealants

B. Section 08412 - Aluminum-Framed Entrances

C. Section 08801 - Glass

### 1.3 REFERENCES:

A. For fenestration Industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA)

### 1.4 PERFORMANCE REQUIREMENTS:

A. General Performance: Aluminum-framed storefront system shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
   1. Design Wind Loads: Manufacturer to determine design wind loads applicable to the project from basic wind speed indicated in miles per hour, according to ASCE7, Section 6.5, "Method 2 - Analytical Procedure" based on mean roof heights above grade indicated on drawings. Applicable wind loads shall be based on, but not limited to:
      a. Basic Wind Speed (MPH)
      b. Importance Factor (I, II, III), and
      c. Exposure Category (A, B, C, D) per ASCE 7, Section 6.5

B. Storefront System Performance Requirements:
   1. Wind Loads: Provide storefront system; include anchorage, capable of withstanding wind load design pressures inward and outward based on the 2007 Arkansas Fire Prevention Code Vol. 2, including 2006 IBC or latest edition there of.
   2. Air Infiltration: the test specimen shall be tested in accordance with ASTM E 283. Air Infiltration rate shall not exceed 0.06 cfm/ft squared at a static air pressure differential of 6.24 psf.
   3. Water Resistance: the test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a minimum static air pressure differential of 8 psf as defined in AAMA 501.
   4. Uniform Load: A static air design load of 20 psf shall be applied in the prsitive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

5. Provide Thermal Transmittance (U-Factor): When tested to AAMA Specification 1503 using glazing material(s) as specified elsewhere in this specification.
6. Provide Condensation Resistance (CRF): When tested to AAMA Specification 1503 using glazing material(s) as specified elsewhere in this specification.
7. Provide Sound Transmission Class (STC) and Outdoor-Indoor Transmission Class (OITC): When tested to AAMA Specification 1801 and in accordance with ASTM E 1425 and ASTM E 90 using glazing material(s) as specified elsewhere in this specification.
8. Windborne-Debris-Impact-Resistance Performance: Shall be tested in accordance with ASTM E 1886 and information in ASTM E 1996 and/or AAMA 506.
   a. Large-Missle Impact: For aluminum-framed systems located within 30 feet of grade.
   b. Small-Missle Impact: For aluminum-framed systems located more than 30 feet above grade.

## 1.5 ACCESSIBILITY REQUIREMENTS:

A. All components, including frames, doors, windows, hardware, and accessories are required to comply with ADAAG Guidelines and State Accessibility Guidelines. Provide and install in accordance with latest ADAAG and State Accessibility Guidelines.

## 1.6 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, hardware, finishes, and installation instructions for each type of aluminum frame storefront system indicated.

C. Shop Drawings: Include plans, elevations, sections, details, hardware, and attachments to other work, operational clearances and installation details.

D. Samples for Initial Selection: For units with factory-applied color finishes including samples of hardware and accessories involving color selection

E. Samples for Verification: For aluminum framed storefront system and components required.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, of aluminum framed storefront.

G. Fabrication Sample: of each vertical to horizontal intersection of aluminum-framed system, made form 12" lengths of full-size components and showing details of the following:
   1. Joinery, including concealed welds
   2. Anchorage
   3. Expansion provisions
   4. Glazing
   5. Flashing and drainage

H. Other Action Submittals:
   1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

## 1.7 QUALITY ASSURANCE:

A. Installer Qualifications: An installer which has had successful experience with installation of the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.

C. Source Limitations: Obtain aluminum framed storefront system through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum framed storefront system and are based on the specific system indicated. Refer to Division 01, Section "Product Requirements". Do not modify size and dimensional requirements.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Where and if required by Architect, build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

F. Pre-installation Conference: Conduct conference at Project site.

G. Structural-Sealant Glazing: Comply with ASTM C 1401, "Guide for Structural Sealant Glazing" for design and installation of structural-sealant-glazed systems.

H. Structural-Sealant Joints: Design reviewed and approved by structural-sealant manufacturer.

**1.8 PROJECT CONDITIONS:**

A. Field Measurements: Verify actual dimensions of aluminum framed storefront openings by field measurements before fabrication and indicate field measurements of Shop Drawings.

**1.9 WARRANTY:**

A. See Section 01780 - Closeout Submittals for additional warranty requirements.

B. Manufactures Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months form date of shipment by manufacturer.

**1.10 DELIVERY, STORAGE, AND PROTECTION:**

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.

**1.11 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.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

A. Kawneer Model Trifab VG 451
   1. Thermal at Exterior Storefront Systems
   2. Non-Thermal at Interior Storefront Systems
   3. 2" x 4-1/2" System Dimensions
   4. Glass: Exterior
   5. Note: At Interior Storefronts coordinate glass position with Architect.

B. Substitutions: See Section 01600 - Product Requirements.
   1. Substitutions may be considered if deemed equal to product specified and approved by Architect and Owner per the following and subject to compliance with all requirements of these Specifications.
      a. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
      b. Submit Manufacturer, Series and Profile dimensions.
      c. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
      d. Certificates: Submit certificate(s) certifying proposed substitute manufacturer
         1) attesting to adherence to specification requirements for storefront system performance criteria and
         2) has been engarded in the design manufacturer and fabrication of aluminum storefront for a period of not less than ten (10) years
      e. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
      f. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

C. Substitution Acceptance: Acceptance will be in written form as an addendum issued by the Architect.

## 2.2 MATERIALS:

A. Aluminum Extrusions: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B 221; 6063-T6 alloy and temper.

B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors and other components.

C. Anchors, Clips and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, non-magnetic stainless steel, or nickel/chrome-plated complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Sealant: For sealants required within fabrication storefront system, provide permanently elastic, non-shrinking and non migrating type recommended by sealant manufacturer for joint size and movement.

F. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

## 2.3 STOREFRONT FRAMING SYSTEM:

A. Thermal Barrier (Trifab VG 451T):
   1. Kawneer IsoLock Thermal Break with a 1/4" separation consisting of a two-part chemically curing, high-density polyurethane which is mechanically and adhesively jointed to aluminum storefront sections.
      a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 5050.

B. Bracket and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials. Where exposes shall be stainless steel.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities and other hazards before, during and after storefront installation.

G. Touch-Up Materials: As recommended by coating manufacturer to field application.

## 2.4 GLAZING SYSTEMS:

A. Glazing: As specified in Division 8.

B. Glazing Gaskets: Manufacturer's standard compression type; replaceable, extruded EPDM rubber.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: For structural-sealant-glazed systems, as recommended by manufacturer for joint type, and as follows:
   1. Structural Sealant: ASTM C 1184, single-component neutral-curing silicone formulation that is compatible iwth system components with which it comes in contact, specifically formulated and tested for use as a structural sealant and approved by a structural-sealant manufacturer for use in aluminum-framed systems indicated.
      a. Color: Black
   2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.
      a. Color: matching structural sealant.

## 2.5 ENTRANCE DOOR SYSTEM:

A. Entrance Doors: As specified in Section 08412 - Aluminum Framed Entrances.

B. Entrance Door Hardware: As specified in Section 08800 - Hardware.

## 2.6 ACCESSORY MATERIALS:

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07900 - Joint Sealants.

B. Bituminous Paint: Color-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30 mil thickness per coat.

## 2.7 FABRICATION:

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fit joints; make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   6. Provisions for field replacement of glazing.
   7. Fasteners, anchors, and connection devices that are concealed form view to greatest extent possible.

B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

C. Structural-Sealant-Glazing Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

D. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 ALUMINUM FINISHES:

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

B. Factory Finishing:
   1. Kawneer Permanodic AA-M12C22A31, AAMA 611, Architectural Class II Clear Anodic Coating - Color #17 Clear, standard.

# PART 3 - EXECUTION

## 3.1 EXAMINATION:

A. Examine openings, substrates, structural support, anchorage and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight framed aluminum storefront system installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3

inches of opening.

3. Metal Surfaces: Dry; clean; free of grease, oil, dust, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION:

A. Comply with drawings, shop drawings, and manufacturer's written instructions for installing aluminum framed storefront system, accessories and other components.

B. Install aluminum framed storefront system level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weather tight construction.

D. Install aluminum framed storefront system and components to drain condensation, water penetrating joints, and moisture migrating within sliding door to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

## 3.3 FIELD QUALITY CONTROL:

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract documents.

1. Testing: Testing shall be performed by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements. Testing Standard per AAMA 503, including reference to ASTM E 783 for Air Infiltration Test and ASTM E 1105 Water infiltration Test.
   a. Air infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft squared, whichever is greater.
   b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 6.24 psf.

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

## 3.4 ADJUSTING, CLEANING, AND PROTECTION:

A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt and other substances.

B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

**END OF SECTION**

# SECTION 08412
# ALUMINUM-FRAMED ENTRANCES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Kawneer Aluminum Entrances, glass and glazing, and door hardware and components.
   1. Types of Kawneer Aluminum Entrances include:
      a. 500 Swing Door: Wide Stile, 5" (127) vertical face dimension, 1-3/4" depth, high traffic applications.

### 1.2 RELATED SECTIONS:

A. Division 8 - Doors and Windows

### 1.3 SYSTEM DESCRIPTION:

A. Entrance Performance Requirements:
   1. Air Infiltration: For single acting offset pivot or butt hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.24 psf for single doors and 1/567 psf for pairs of doors. A single 3' x 7' entrance door and frame shall not exceed 0.50 cfm per square foot. A pair of 6' x 7' entrance doors and frame shall not exceed 1.0 cfm per square foot.
   2. Structural: Corner strength shall be tested per the Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity. Test procedure and certified test results available upon request.

### 1.4 ACCESSIBILITY REQUIREMENTS:

A. All components, including frames, doors, windows, hardware, and accessories are required to comply with ADAAG Guidelines and State Accessibility Guidelines. Provide and install in accordance with latest ADAAG and State Accessibility Guidelines.

### 1.5 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. General: Prepare, review, approve and submit specified submittals in accordance with Conditions of the Contract and Submittal Sections. Product data, shop drawings, samples, and similar submittals are defined in Conditions of the Contract.

C. Quality Assurance/Control Submittals:
   1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

### 1.6 QUALITY ASSURANCE:

A. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.

B. Manufacturer Qualifications: A manufacturer capable of providing structural calculations, applicable independent product test reports, installation instructions, a review of the application method, customer approval and periodic field service representative during construction.

C. On access control installations, all wiring to be coordinated with a licensed electrical installer.

D. Pre-Installation Meeting: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

## 1.7 WARRANTY:

A. See Section 01780 - Closeout Submittals for additional warranty requirements.

B. Project Warranty: refer to Conditions of the Contract for project warranty provisions.

C. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for entrance system as follows:
   1. Warranty Period: Two (2) years form Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from the date of shipment by manufacturer. In addition, welded door corner construction shall be supported with limited lifetime warranty for the life of the door under normal use.

## 1.8 DELIVERY, STORAGE, AND HANDLING:

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store material protected from exposure to harmful weather conditions. Handle entrance doors and components to avoid damage. Protect entrance doors against damage from elements, construction activities, and other hazards before, during and after entrance installation.

## 1.9 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.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS:

A. Acceptable Manufacturers / Products:
   1. Kawneer Company, Inc.; 555 Guthridge Court, Technology park/Atlanta, Norcross, GA 30092; Phone: (770) 449 5555; Fax: (770) 734-1560.
   2. Proprietary Product(s) / System(s): Kawneer Aluminum Entrances
      a. Series: 500 Swing Doors
      b. Finish/Color: See paragraph 2.6 Finishes

B. Substitutions: See Section 01600 - Product Requirements.
   1. Substitutions may be considered if deemed equal to product specified and approved by Architect and Owner per the following and subject to compliance with all requirements of these Specifications.
      a. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
      b. Submit Manufacturer, Series and Profile dimensions.

c. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.

d. Certificates: Submit certificate(s) certifying proposed substitute manufacturer
   1) attesting to adherence to specification requirements for entrance door performance criteria and
   2) has been engarded in the design manufacturer and fabrication of aluminum entrance door for a period of not less than ten (10) years

e. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.

f. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

C. Substitution Acceptance: Acceptance will be in written form as an addendum issued by the Architect.

## 2.2 MATERIALS:

A. Aluminum Entrances and Components:
1. Material Standard: ASTM B 221; 6063-T6 alloy and temper.
2. The door stile and rail face dimensions of the 500 entrance door will be as follows:

| Door | Vertical Stile | Top Rail | Bottom Rail |
|---|---|---|---|
| 500 | 5" (127) | 5" (127) | 10" minimum |

3. Major portions of the door members to be 0.125" nominal in thickness and glazing molding to be 0.05" thick.
4. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.

B. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

C. Provide adjustable glass jacks to help center the glass in the door opening.

## 2.3 ACCESSORIES:

A. Fasteners: Where exposed, shall be aluminum, stainless steel or plated steel.

B. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel materials and aluminum material to prevent galvanic action.

C. Standard Entrance Hardware:
1. Provide all hardware required for complete and proper door operation as recommended by door manufacturer for application and conditions indicated on drawings based on the following:
   a. Weatherstripping:
      1) Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
      2) The weathering on a single acting offset pivot or butt hung door and frame (single or pairs) shall be Kawneer Sealair weathering.. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
   b. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners (necessary to meet specified performance tests).
   c. Thresholds: Extruded aluminum, one piece per door opening, with ribbed surface. Must meet "ADA" requirements for handicapped accessible

d. Offset Pivots: Kawneer offset pivots
e. Butt Hinges: Standard tope and bottom 4-1/2" x 4" ball bearing ith NRP. Kawneer Standard is Stainless Steel with Powder Coating and Non Removable Pin (NRP)
f. Push/Pull: CO-12 / CP-II
g. Exit Device: Concealed Road Dor-O-Matic Falcon 1990
h. Closer: Norton 8100 surface with back-check and hold open features. Note: Coordinate final selection of closer with automatic door operators.
i. Security Lock/Dead Lock: Active leaf Adams-Rite MS 1850A; inactive leaf "Controller".
j. Cylinder(s)/Thumbturn: See Section 08710.

## 2.4 RELATED MATERIALS:

A. Sealants: Refer to Division 8 - Joint Sealants

B. Glass: Refer to Division 8 - Glass.

## 2.5 FABRICATION:

A. Entrance System Fabrication:
1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" (29) long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
2. Accurately fit and secure joints and corners. Make joints hairline in appearance.
3. Prepare components with internal reinforcement for door hardware.
4. Arrange fasteners and attachments to conceal from view.

## 2.6 FINISHES:

A. Factory Finishing:
1. Kawneer Permanodic AA-M12C22A31, AAMA 611, Architectural Class II Clear Anodic Coating, Color #17 Clear, Standard.

## 2.7 SOURCE QUALITY CONTROL:

A. Source Quality: Provide aluminum entrances specified herein from a single source.
1. Building Enclosure System: When aluminum entrances are part of a building enclosure system, including storefront framing, windows, curtain wall system and related products, provide building enclosure system products form a single source manufacturer.

B. Fabrication Tolerances: Fabricate aluminum entrances in accordance with entrance manufacturer's prescribed tolerances.

# PART 3 - EXECUTION

## 3.1 EXAMINATION:

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive entrance system and sill plate is level in accordance with manufacturer's acceptable tolerances.
1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field

measurements, fabrication schedule with construction progress to avoid construction delays.

## 3.2 INSTALLATION:

A. General: Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.
   1. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
   2. Provide alignment attachments and shims to permanently fasten system to building structure.
   3. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.
   4. Set thresholds in bed of mastic and secure.
   5. Adjusting: Adjust operating hardware for smooth operation.

B. Related Products Installation Requirements:
   1. Sealants (perimeter): Refer to Joint Sealant Section
   2. Glass: Refer to Glass Section.
      a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Manual.

## 3.3 CLEANING AND PROTECTION:

A. Cleaning: Remove temporary coverings and protection and adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose and debris.

B. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum entrances from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants. Remove and replace damaged aluminum entrances at no extra cost.

**END OF SECTION**

# SECTION 08441
# GLAZED ALUMINUM CURTAIN WALLS

## 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: Kawneer Architectural Aluminum Curtain Wall Systems, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of curtain wall framing.
   1. Types of Kawneer Aluminum Curtain Wall include:
      a. 1600 Wall System™4 Curtain Wall - 2-1/2 x 7-1/2" (57.2 x 190.5), outside glazed format.

B. Related Sections:
   1. Section 07272 – Weather Resistant Membrane Fabric
   2. Section 07900 - Joint Sealants
   3. Section 08412 - Aluminum-Framed Entrances
   4. Section 08411 - Aluminum-Framed Storefronts
   5. 08801 – Glass

### 1.3 Definitions

A. Definitions: For fenestration industry standard terminology and definitions refer to American Architectural Manufactures Association (AAMA) – AAMA Glossary (AAMA AG).

### 1.4 Performance Requirements

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
   1. Glazed aluminum curtain walls shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads. Failure also includes the following:
      a. Thermal stresses transferring to building structure.
      b. Glass breakage.
      c. Loosening or weakening of fasteners, attachments, and other components.
      d. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind loads: Provide Curtain Wall system; include anchorage, capable of withstanding wind load design pressures based on 2012 Arkansas Fire Prevention Code (2012 IBC with Arkansas Amendments).

D. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283. Air infiltration rate shall not exceed 0.06 cfm/ft$^2$ (0.3 l/s · m$^2$) at a static air pressure differential of 6.24 psf (300 Pa).

E. Water Resistance, (static): The test specimen shall be tested in accordance with ASTM E 331. There shall be no leakage at a static air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.

F. Water Resistance, (dynamic): The test specimen shall be tested in accordance with AAMA 501.1. There shall be no leakage at an air pressure differential of 12 psf (575 Pa) as defined in AAMA 501.

G. Uniform Load: A static air design load of 50 psf (2394 Pa) shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

H. Seismic: Phase I: 3 stroke cycles using .005 x the story height – no damage or failure.
   Phase II: 3 stroke cycles using .010 x the story height – no damage or failure.

I. Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.60 (clear

J. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than $74_{frame}$ and $60_{glass}$ (clear),

### 1.5 Submittals

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency, for glazed aluminum curtain walls, indicating compliance with performance requirements.

F. Fabrication Sample: Of each vertical-to-horizontal intersection of aluminum-framed curtain wall systems, made from 12" (304.8 mm) lengths of full-size components and showing details of the following:
   1. Joinery
   2. Glazing

### 1.6 Quality Assurance

A. Installer Qualifications: Installer who has had successful experience with installation of the same or similar systems required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed performance requirements.

C. Source Limitations: Obtain aluminum curtain wall system through one source from a single manufacturer.

D. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockups for type(s) of curtain wall elevation(s) indicated, in location(s) shown on Drawings.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination".

### 1.7 Project Conditions

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

### 1.8 Warranty

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty.
   1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer.

## PART 2 - PRODUCTS

### 2.1 Manufacturers

A. Basis-of-Design Product:

1. Kawneer Company Inc.
2. 1600 Wall System™4 Curtain Wall.
3. Frame depth 2-1/2 x 7-1/2" (57.2 x 190.5), outside glazed format.
4. Tested to AAMA 501.

B. Substitutions: Refer to Substitutions Section for procedures and submission requirements.
1. Pre-Contract (Bidding Period) Substitutions: Submit written requests ten (10) days prior to bid date.
2. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.
3. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for curtain wall system performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum curtain walls for a period of not less than ten (10) years.
4. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.
5. Samples: Provide samples of typical product sections and finish samples in manufacturer's standard sizes.

C. Substitution Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

**2.2 Materials**

A. Aluminum Extrusions: Alloy and temper recommended by glazed aluminum curtain wall manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" (1.8) wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.

B. Aluminum sheet alloy: Shall meet the requirements of ASTM B209.

C. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.

D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.

F. Sealant: For sealants required within fabricated curtain wall system, provide permanently elastic, non-shrinking, and non-migrating type recommended by sealant manufacturer for joint size and movement.

G. Thermal Barrier: Thermal barrier shall utilize Kawneer IsoStrut™ consisting of a rigid polymer that provides a mechanical and chemical bond between the thermal break material and extrusion. Horizontals shall utilize a silicone compatible elastomer thermal break separator which provides a minimum 1/4" separation.

H. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of glazed curtain wall members are nominal and in compliance with AA Aluminum Standards and Data.

**2.3 Curtain Wall Framing**

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Glazing System: 4 sided captured.
2. Glazing Plane: Front.

B. Glass: 1" (25.4) insulating glass option. 1/4" (6.3) for Spandrel applications.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Framing Sealants: Shall be suitable for glazed aluminum curtain wall as recommended by sealant manufacturer.

E. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.

F. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

G. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

H. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle curtain wall material and components to avoid damage. Protect curtain wall material against damage from elements, construction activities, and other hazards before, during and after installation.

**2.4 Glazing**

A. Glazing: Comply with Division 08 Section "Glazing". Following glazing options are available.
   1. 1600 Wall System™4 Curtain Wall: Inside/outside glazed captured format with 1" (25.4) double glazed insulating glass.

B. Glazing Gaskets: Gaskets to meet the requirements of ASTM C864.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Glazing Sealants: As recommended by manufacturer for joint type.

**2.5 Operable Units**

A. Doors: Comply with Division 08 Section "Aluminum-Framed Entrances and Storefronts".

B. Windows: Comply with Division 08 Section "Aluminum Windows".

**2.6 Accessory Materials**

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762 mm) thickness per coat.

B. InLighten™ Light Shelf: aluminum light shelf system consisting of anchor channels, support beams, fascia trims and Aluminum Composite Material (ACM) panels that is anchored directly to the Curtain Wall intermediate horizontal members.
   1. Light Shelf: Interior mounted shelf to reflect daylight deeper into interior space.
   2. Light Shelf System to consist of:
      a. Alluminum Composite Material (ACM) panel, 4mm thick.
      b. Translucent polycarbonate panel, 4mm/16mm thick.
      c. ACM finish on upper and lower surface shall be selected from Kawneer standard finishes.
      d. Extruded Aluminum outriggers and fascia.
      e. Extruded aluminum anchor designed to secure to compatible verticals of framing system. Anchor shall be designed to engage shelf so as to allow the shelf to rotate down and hang on its own safely for cleaning.
      f. Extruded aluminum shear blocks designed to hinge on the anchors to allow rotating individual shelves for cleaning.
      g. Panel /Shelf projection shall not exceed 30" (762 mm).
      h. Mullion spacing of framing system shall not exceed 6' (1.83 m) on center.
      i. Panel /Shelf deflection shall not exceed L/120 of horizontal span length.
   3. Framing System to Support Light Shelf shall be: (select appropriate framing system)
      a. Curtain Wall framing system.
      b. Storefront Framing System.
   4. Submittals.
      a. Manufacturer's Installation Instructions.
      b. Samples for Verification.
         1) Factory applied finish as selected by architect.
         2) Functioning Light Shelf sample demonstrating operation.
      c. Shop Drawing including:
         1) Plans, elevations, sections, fabrication and installation details.

C. Validation from manufacture of single-source for light shelf and framing system and compatibility between the system.

### 2.7 Fabrication

A. Form or extrude aluminum shapes before finishing.

B. Fabricate components that, when assembled, have the following characteristics:
   1. Profiles that are sharp, straight, and free of defects or deformations.
   2. Accurately fitted joints.
   3. Physical and thermal isolation of glazing from framing members.
   4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   5. Provisions for field replacement of glazing from exterior.
   6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
   7. Internal weeping system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

C. Curtain Wall Framing: Fabricate components for assembly using shear block system following manufacturer's standard installation instructions.

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

### 2.8 Aluminum Finishes

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

B. Factory Finishing:
   1. Kawneer Permanodic™ AA-M10C21A44 / AA-M45C22A44, AAMA 611, Architectural Class II Clear Anodic Coating (Color #17 Clear, Standard).

## PART 3 - EXECUTION

### 3.1 Examination

A. Examine areas, with Installer present, 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.

### 3.2 Installation

A. General: Install curtain wall systems plumb, level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
   1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
   2. Glazing: Glass shall be outside glazed and held in place with extruded aluminum pressure plates anchored to the mullion using stainless steel fasteners spaced no greater than 9" (228.6) on center.
   3. Water Drainage: Each light of glass shall be compartmentalized using joint plugs and silicone sealant to divert water to the horizontal weep locations. Weep holes shall be located in the horizontal pressure plates and covers to divert water to the exterior of the building.

B. Related Products Installation Requirements:
   1. Sealants (Perimeter): Refer to Joint Treatment (Sealants) Section and to curtain wall manufacturer's recommendations.
   2. Glass: Refer to Glass and Glazing Section.
      a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual

### 3.3 Field Quality Control

A. Field Tests: Architect shall select curtain wall units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Conduct tests for air infiltration and water penetration with manufacturer's representative present. Tests not meeting specified performance requirements and units having deficiencies shall be corrected as part of the contract amount.

1. Testing: Testing shall be performed per AAMA 503 by a qualified independent testing agency. Refer to Testing Section for payment of testing and testing requirements.
   a. Air Infiltration Tests: Conduct tests in accordance with ASTM E 783. Allowable air infiltration shall not exceed 1.5 times the amount indicated in the performance requirements or 0.09 cfm/ft$^2$, which ever is greater.
   b. Water Infiltration Tests: Conduct tests in accordance with ASTM E 1105. No uncontrolled water leakage is permitted when tested at a static test pressure of two-thirds the specified water penetration pressure but not less than 8 psf (383 Pa).

B. Manufacturer's Field Services: Upon Owner's written request, provide periodic site visit by manufacturer's field service representative.

### 3.4 Adjusting, Cleaning and Protection

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum curtain wall system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

**END OF SECTION**

# SECTION 08452
# INSULATED TRANSLUCENT UNIT WALL SYSTEM

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes the insulated translucent sandwich panel system and accessories, factory unitized, as shown and specified. Work includes providing and installing:
   1. Flat factory prefabricated structural insulated translucent sandwich panels
   2. Aluminum installation system
   3. Aluminum sill flashing
   4. Thermal break windows

B. Related Sections:
   1. Structural Steel: Section 05100
   2. Sheet Meta, Flashing and Triml: Section 07620
   3. Joint Sealers: Section 07900
   4. Glass: Section 08801
   5. Vertical Lift Strap Bi-Fold Door: Section 08441

### 1.2 SUBMITTALS

A. Submit manufacturer's product data. Include construction details, material descriptions, profiles and finishes of components.

B. Submit shop drawings. Include elevations and details.

C. Submit manufacturer's color charts showing the full range of colors available for factory-finished aluminum.
   1. When requested, submit samples for each exposed finish required, in same thickness and material indicated for the work and in size indicated below. If finishes involve normal color variations, include sample sets consisting of two or more units showing the full range of variations expected.
      a. Sandwich panels: 14" x 28" units
      b. Factory finished aluminum: 5" long sections

D. Submit Installer Certificate, signed by installer, certifying compliance with project qualification requirements.

E. Submit product reports from a qualified independent testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed reports will be acceptable if for current manufacturer and indicative of products used on this project.
   1. Reports required are:
      a. International Building Code Evaluation Report
      b. Flame Spread and Smoke Developed (UL 723) – Submit UL Card
      c. Burn Extent (ASTM D 635)
      d. Color Difference (ASTM D 2244)
      e. Impact Strength (UL 972)
      f. Bond Tensile Strength (ASTM C 297 after aging by ASTM D 1037)
      g. Bond Shear Strength (ASTM D 1002)
      h. Beam Bending Strength (ASTM E 72)
      i. Insulation U-Factor (NFRC 100)
      j. NFRC System U-Factor Certification (NFRC 700)
      k. Solar Heat Gain Coefficient (NFRC or Calculations)
      l. Condensation Resistance Factor (AAMA 1503)

m. Air Leakage (ASTM E 283)
n. Structural Performance (ASTM E 330)
o. Water Penetration (ASTM E 331)
p. 1200°F Fire Resistance (SWRI)

## 1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications
1. Material and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least ten consecutive years and which can show evidence of those materials being satisfactorily used on at least six projects of similar size, scope and location. At least three of the projects shall have been in successful use for ten years or longer.
2. Panel system must be listed by an ANSI accredited Evaluation Service, which requires quality control inspections and fire, structural and water infiltration testing of sandwich panel systems by an accredited agency.
3. Quality control inspections shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with AC177 "Translucent Fiberglass Reinforced Plastic (FRP) Faced Panel Wall, Roof and Skylight Systems" as issued by the ICC-ES.

B. Installer's Qualifications: Installation shall be by an experienced installer, which has been in the business of installing specified panel systems for at least two consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

## 1.4 PERFORMANCE REQUIREMENTS

A. The manufacturer shall be responsible for the configuration and fabrication of the complete unitized panel system. Coordinate all materials and labor related to manufacturing and installing translucent wall system to exterior face of Bi-Fold Door Framing complete, watertight, ready for Owner's operation and use of Bi-Fold Door.
1. When requested, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Standard panel system shall have less than 0.01 cfm/ft² air leakage by ASTM E 283 at 6.24 PSF (50 mph) and no water penetration by ASTM E 331 at 15 PSF; and structural testing by ASTM E 330.
3. Structural Loads; Provide system capable of handling the following loads:
a. Positive Wind Load: See Structural Drawings
b. Negative Wind Load: See Structural Drawings
Seismic Design Criteria: See Structural Drawings

## 1.5 DELIVERY STORAGE AND HANDLING

A. Deliver panel system, components and materials in manufacturer's standard protective packaging.

B. Store panels on the long edge; several inches above the ground, blocked and under cover in accordance with manufacturer's storage and handling instructions.

## 1.6 WARRANTY

A. Submit manufacturer's and installer's written warranty agreeing to repair or replace panel system work, which fails in materials or workmanship within one year of the date of delivery. Failure of materials or workmanship shall include leakage, excessive deflection, deterioration of finish on metal in excess of normal weathering, defects in accessories, insulated translucent sandwich panels and other components of the work.

B. Extended Warranty: 5 year materials and workmanship and up to 10 year limited warranty.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURER

A. The basis for this specification is for products manufactured by Kalwall Corporation. Other manufacturers may bid this project provided they comply with all of the performance requirements of this specification and submit evidence thereof. Listing other manufacturers' names in this specification does not constitute approval of their products or relieve them of compliance with all the performance requirements contained herein.

B. Kalwall Corporation, Tel: (800) 258-9777 – Fax: (603) 627-7905 – Email: info@kalwall.com

## 2.2 PANEL COMPONENTS

A. Face Sheets
1. Translucent faces: Manufactured from glass fiber reinforced thermoset resins, formulated specifically for architectural use.
   a. Thermoplastic (e.g. polycarbonate, acrylic) faces are not acceptable.
   b. Face sheets shall not deform, deflect or drip when subjected to fire or flame.
2. Interior face sheets:
   a. Flame spread: Underwriters Laboratories (UL) listed, which requires periodic unannounced retesting, with flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with UL 723.
   b. Burn extent by ASTM D 635 shall be no greater than 1".
3. Exterior face sheets:
   a. Color stability: Full thickness of the exterior face sheet shall not change color more than 3 CIE Units DELTA E by ASTM D 2244 after 5 years outdoor South Florida weathering at 5° facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure long-term color stability. Color stability shall be unaffected by abrasion or scratching.
   b. Strength: Exterior face sheet shall be uniform in strength, impenetrable by hand held pencil and repel an impact minimum of 70 ft. lbs. without fracture or tear when impacted by a 3-1/4" diameter, 5 lb. free-falling ball per UL 972.
4. Appearance:
   a. Exterior face sheets: Smooth .070 thick and Crystal in color.
   b. Interior face sheets: Smooth .052 thick and White in color.
   c. Face sheets shall not vary more than ± 10% in thickness and be uniform in color.

B. Grid Core
1. Thermally Broken Composite I-beam grid core shall be of 6063-T6 or 6005-T5 alloy and temper with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16".
2. I-beam Thermal break: Minimum 1", thermoset fiberglass composite.

C. Laminate Adhesive
1. Heat and pressure resin type adhesive engineered for structural sandwich panel use, with minimum 25-years field use. Adhesive shall pass testing requirements specified by the International Code Council "Acceptance Criteria for Sandwich Panel Adhesives".
2. Minimum tensile strength of 750 PSI when the panel assembly is tested by ASTM C 297 after two exposures to six cycles each of the aging conditions prescribed by ASTM D 1037.
3. Minimum shear strength of the panel adhesive by ASTM D 1002 after exposure to four separate conditions:
   a. 50% Relative Humidity at 68° F: 540 PSI
   b. 182° F: 100 PSI
   c. Accelerated Aging by ASTM D 1037 at room temperature: 800 PSI
   d. Accelerated Aging by ASTM D 1037 at 182° F: 250 PSI

## 2.3 PANEL CONSTRUCTION

A. Provide sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking I-beams. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.
   1. Thickness: 2-3/4"
   2. Light transmission: 20%
   3. Solar heat gain coefficient .28.
   4. Panel U-factor by NFRC certified laboratory: 2-3/4" thermally broken grid.
   5. Complete insulated panel system shall have NFRC certified U-factor.
   6. Grid pattern: Nominal size 12" x 20"; pattern - Shoji.

B. Standard panels shall deflect no more than 1.9" at 30 PSF in 10' 0" span without a supporting frame by ASTM E 72.

C. Standard panels shall withstand 1200° F fire for minimum one hour without collapse or exterior flaming.

D. Thermally broken panels: Minimum Condensation Resistance Factor of 80 by AAMA 1503 measured on the bond line.

## 2.4 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system: Thermally Broken extruded aluminum 6063-T6 and 6063-T5 alloy and temper clamp-tite screw type closure system.

B. Sealing tape: Manufacturer's standard, pre-applied to closure system at the factory under controlled conditions.

C. Fasteners: 300 series stainless steel screws for aluminum closures, excluding final fasteners to the building.

D. Finish:
   1. Manufacturer's factory applied finish, which meets the performance requirements of AAMA 2604. Color to be selected from manufacturer's standards. Submit actual color chips to Architect for selection.

## 2.5 WINDOWS

A. Windows shall be designed specifically for inclusion in the translucent panel unit wall system and factory unitized to panels.
   1. Units shall be of the following type(s):
      a. Fixed lite

B. Performance: Windows shall pass or exceed requirements of AAMA/WDMA/CSA-101/I.S.2/A440-05 (08).
   1. **HC-2000 fixed widows: F-AW80**; shall pass requirements at 120 psf uniform structural load with air infiltration <.01 CFM/FT$^2$ at 6.24 psf and no water penetration at 12 psf.

C. Construction: All window frame members shall be of heavy gauge 6063-T5 extruded aluminum with a thermal break. Frame sections shall be coped and joined by stainless steel screws at each corner. All joints exposed to the weather shall be sealed with an elastic compound. All openings shall be double weather stripped using T-slot bulb gaskets to insure minimum air infiltration.
   1. Operating sash shall be hollow extruded design, mitered and joined with heavy reinforcing corners.
   2. Both operable and fixed lites shall be inside glazed with an expanded EPDM closed cell sponge gasket to exterior, with aluminum glazing bead and a driven EPDM wedge gasket to the interior for rapid removal and replacement.

D. Glazing:
   1. Heavy commercial (HC2000) windows shall be glazed with 1" double insulated glass.
   2. Glass Specification: Section 08801.

E. Finish is to be coordinated with closure system.

F. Insect Screens shall not be supplied.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Installer shall examine substrates, supporting structure and installation conditions.

B. Do not proceed with panel installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete, masonry or pressure treated wood, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.

### 3.3 INSTALLATION

A. Install the panel system in accordance with the manufacturer's suggested installation recommendations and approved shop drawings.
   1. Anchor component parts securely in place by permanent mechanical attachment system.
   2. Accommodate thermal and mechanical movements.
   3. Set perimeter framing in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

B. Install joint sealants at perimeter joints and within the panel system in accordance with manufacturer's installation instructions.

### 3.4 CLEANING

A. Clean the panel system interior and exterior, immediately after installation.

B. Refer to manufacturer's written recommendations.

**END OF SECTION**

# SECTION 08710
# DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Hardware for wood doors, metal doors and aluminum doors as noted.

B. Lock cylinders for doors for which hardware is specified in other sections.

C. Thresholds

D. Weatherstripping, seals and door gaskets.

### 1.2 RELATED SECTIONS:

A. Refer to Division 8 - Doors and Windows

### 1.3 REFERENCES:

A. ANSI/CABO A117.1 - American National Standard for Buildings and Facilities - Providing Accessible and Usable Buildings and Facilities; Council of American Building Officials; 1992.

B. BHMA A156.1 American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association; 1997 (ANSI/BHMA A156.1).

C. BHMA A156.2 American National Standard for Bored and Reassembled Locks & Latches; Builders Hardware Manufacturers Association; 1996 (ANSI/BHMA A156.2).

D. BHMA A156.3 American National Standard for Exit Devices;; Builders Hardware Manufacturers Association; 1994 (ANSI/BHMA A156.3).

E. BHMA A156.4 American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association; 1992 (ANSI/BHMA A156.4).

F. BHMA A156.7 American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 1988 (ANSI/BHMA A156.7).

G. BHMA A156.15 American National Standard for Closer Holder Release Devices; Builders Hardware Manufacturers Association; 1995 (ANSI/BHMA A156.15).

H. DHI A115 Series - American National Standard Specifications for Steel Doors and Frame Preparation for Hardware; Door and Hardware Institute; current edition.

I. NFPA 80 - Standard for Fire Doors and Windows; 1995

J. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; 1997.

K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 1995.

L. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc; current edition.

**1.4 WORK NOT INCLUDED:**

A. Window Hardware

B. Folding Partition Hardware

C. Toilet Partition Hardware

D. Overhead Door Hardware (except padlocks)

E. Cabinet and Millwork Hardware.

**1.5 CONDITIONS:**

A. The general conditions, supplementary general conditions, and all contract documents are a part of this division of the specifications and all provisions contained herein. Submission of the proposal implies that the bidder is fully familiar with all requirements of the said documents.

**1.6 SCOPE:**

A. The finish hardware supplier shall furnish all necessary items for completion for this project, as specified in paragraph 3.05, hardware sets, or as necessary to complete this building excepting the items specifically excluded.

**1.7 SUBMITTALS:**

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate locations and mounting heights of each type of hardware, schedules, catalog cuts, electrical characteristics and connection requirements.
1. Submit manufacturer's parts lists and templates.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

D. Keys: Deliver with identifying tages to Owner by security shipment direct from hardware supplier.

E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

**1.8 ACCESSIBILITY REQUIREMENTS:**

A. All hardware components and accessories, including thresholds and closers, are required to comply with ADAAG Guidelines and State Accessibility Guidelines. Provide and install in accordance with latest ADAAG and State Accessibility Guidelines.

**1.9 COORDINATION:**

A. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Coordinate Owner's keying requirements during the course of the Work.

**1.10 QUALITY ASSURANCE:**

A. The hardware supplier shall submit six (6) typewritten hardware schedules to the architect through the general contractor for approval. Each schedule shall contain the door index listing of the opening on the project and the hardware for said openings. Each item of hardware listed is to be clearly identified by manufacturer, manufacturer's number and finish.

B. The Architect retains the authority to approve or reject any schedule based upon his knowledge of the supplier's experience and capabilities, the general quality of the products submitted and compliance with the specifications.

C. If requested, the supplier shall provide working samples of any items he proposed to substitute. Samples will be returned to the job site for installation.

D. The hardware supplier shall forward template information to all related trades within ten (10) days after receipt of approved hardware schedules. Template submission shall be made in accordance with the latest standards as published by The Door and Hardware Institute.

E. The supplier shall forward wiring diagrams to all affected trades within ten (10) days after receipt of approved hardware schedule.

F. The hardware supplier shall prepare a packet containing a complete up to date copy of the hardware schedule, two copies of any installation and or maintenance instructions for items provided on the project and two sets of installation and adjustment tools, including dogging keys and emergency keys for any hardware requiring these tools. The maintenance package is to be delivered to the general contractor with the key control system and the master keys.

**1.11 DELIVERY, STORAGE AND HANDLING:**

A. All items of hardware shall be clearly marked with door number, key, symbol, and heading number to correspond with the approved hardware schedule.

B. The General Contractor will be responsible for providing a dry, clean, locked room of adequate size for storage of hardware.

**1.12 MAINTENANCE PRODUCTS:**

A. Provide special wrenches and tools applicable to each different or special hardware component.

B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

**1.13 GUARANTEE:**

A. The hardware supplier shall guarantee that all materials furnished under this division will be free from defects and blemishes for a period of one (1) year from date of acceptance. The supplier shall repair or replace at his expense, including labor, when instructed to do so by the Architect and/or Owner any item of finish hardware which may prove to be defective within said period.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Product numbers listed in the following specifications are taken from the catalogs of manufacturers listed as follows:

| | | | |
|---|---|---|---|
| 1. | (S) | Stanley Security Solutions | Indianapolis, Indiana |
| 2. | (B) | Best Access Systems | Indianapolis, Indiana |
| 3. | (P) | Precision Hardware | Indianapolis, Indiana |
| 4. | (T) | Trimco | Los Angeles, California |
| 5. | (NG) | National Guard Products | Memphis, Tennessee |
| 6. | (AB) | ABH Manufacturing | Elk Grove Village, Illinois |
| 7. | (L) | Lund Equipment Company | Bath, Ohio |
| 8. | (A) | Adams Rite Manufacturing | Glendale, California |

### 2.2 FINISH:

A. The finish in general shall be satin chrome (BHMA 626 or BHMA 652).

B. Satin stainless steel (BHMA 630) may be provided at the supplier's option.

C. Door closers shall be painted aluminum (BHMA 689).

D. Thresholds and weatherstrips shall be mill finish aluminum.

### 2.3 MATERIALS:

A. All hinges shall be commercial weight template hinges.

B. Provide locksets that meet appropriate ANSI Specifications for this application.

C. Cylinders and Keys: Provide cylinders of brass and keys of brass or nickel-silver.

D. Door Closers: Provide door closers that are fully adjustable with separate valves for closing speed, latching speed, and back check. Must meet or exceed ADA requirements.

### 2.4 FASTENERS:

A. Where sex nut bolts are specified in paragraph 3.5, furnish sex bolts sized to the thickness of the door.

B. Wood screws are to be threaded to the head.

C. Material for fasteners shall be ferrous or non-ferrous matching the product being applied.

D. Length of fasteners shall be sufficient to afford adequate thread engagement.

### 2.5 KEYING:

A. All locks are to be subject to the existing Best key system.

B. Provide twenty (20%) of locks with temporary construction cores.

C. Furnish four (4) keys per keyed alike and two (2) keys each for all other locks.

D. There shall be six (6) master keys furnished.

E. Furnish ten (10) construction keys and four (4) construction control keys.

F. A representative of the Best Lock Company shall consult with the owner's representative to determine permanent keying.

G. Permanent cores and keys are to be delivered to the designated representative of the owner.

H. Installation of the permanent cores is to be by the general contractor. Construction cores are to be returned to the owner's representative.

I. The supplier shall prepare a recommended keying schedule and include it in the hardware schedule submitted for approval. Following approval, the supplier shall establish a meeting with the owner or owner's representative to review and gain approval of the final keying system. Confirmation of the meeting and attendees shall be given to the general contractor in writing and four final copies of the hardware schedule containing keying revisions shall be submitted to the general contractor for his files and field use.

**2.6 KEY CONTROL SYSTEM:**

A. Provide a complete key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers and standard metal cabinet. The size of the system is to be 150% of the number of locks required for the project.

**PART 3 - EXECUTION**

**3.1 EXAMINATION/INSPECTION:**

A. Condition of opening size shall be verified by the general contractor as to door frames being plumb and of correct tolerances to receive door and hardware.

B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

C. Verify that electric power is available to power operated devices and of the correct characteristics.

**3.2 INSTALLATION:**

A. The installer shall be competent and have knowledge of hardware.

B. Mounting heights for all hardware shall be recommended by The Door and Hardware Institute..

C. Install all hardware and hardware accessory items to meet applicable Federal, State and local accessibility regulations.

D. Install hardware in accordance with manufacturer's instructions.

E. Use templates provided by hardware item manufacturer.

F. Mounting heights for hardware from finished floor to center line of hardware item: As listed in schedule, unless otherwise noted.

## 3.3 ADJUSTMENT

A. The installer is to make adjustments as necessary to insure proper operation of all hardware items.

B. Door opening force: In accordance with the Americans with Disabilities Act (ADA), adjust all door hardware so that the maximum force required for pushing or pulling open a door shall be as follows:

1. Fire doors shall have the minimum opening force allowable by the appropriate administrative authority.
2. Exterior hinged doors: 8.5 LBF
3. Interior hinged doors: 5.0 LBF
4. Sliding or folding doors: 5.0 LBF

These forces do not apply to the force required to retract latch bolts or disengage other devices that may hold the door in a closed position.

C. Door Closers: If door is equipped with a closer, then the sweep period of the closer shall be adjusted so that from an open position to 70°, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

D. The installer shall check the door closer adjustment after testing and balancing of the HVAC system and make any corrections as required. In addition, the door closers are to be checked six months after the date of final completion and adjusted as necessary.

## 3.4 PROTECTION:

A. The General Contractor is responsible for protection of all items for hardware until Owner accepts the project as complete.

## 3.5 HARDWARE SETS:

A. The following is a general listing of the minimum hardware requirements. Any item of hardware normally required by good practice, or as to meet State and local codes, shall be furnished even though it may not be specifically mentioned.

B. HW-1(Each pair to have): Doors: 1, 49, 68, 83 (Double doors at exterior)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | P | 1 | Panic Device | 2603 |
| 3. | P | 1 | Panic Device | 2603 |
| 4. | B | 2 | Cylinders | |
| 5. | T | 2 | Pulls | 1191-4 |
| 6. | S | 1 | Auto Operator | D4990 |
| 7. | S | 1 | Closer | D3551 TJ |
| 8. | T | 2 | Stops | 7281 |
| 9. | NG | 1 | Threshold | 425HD x WS/PA |
| 10. | NG | 2 | Door Bottoms | 200S |
| 11. | NG | 1 | Set Gasketing | 5075 |
| 12. | S | 1 | Activate Buttons | CL4990 |

C. HW-1A (Each to have): Doors: 140 (Single doors at exterior)

| | | | | |
|---|---|---|---|---|
| 1. | S | 1 | Hinges | 662HD |
| 2. | P | 1 | Panic Device | 2603 |
| 3. | B | 1 | Cylinders | |
| 4. | T | 1 | Pulls | 1191-4 |
| 5. | S | 1 | Auto Operator | D4990 |
| 6. | S | 1 | Closer | D3551 TJ |
| 7. | T | 1 | Stops | 7281 |
| 8. | NG | 1 | Threshold | 425HD x WS/PA |
| 9. | NG | 1 | Door Bottoms | 200S |
| 10. | NG | 1 | Set Gasketing | 5075 |
| 11. | S | 1 | Activate Buttons | CL4990 |

D. HW-2 (Each pair to have): Doors: 2, 48, 67, 82 (Double doors at interior)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | T | 2 | Sets Push/Pull Bars | 1738x(2) 1741xType N Mounting |
| 3. | S | 1 | Auto Operator | D4990 |
| 4. | S | 1 | Closer | D3551 |
| 5. | T | 2 | Stops | 7280 |
| 6. | S | 1 | Activate Buttons | CL4990 |

E. HW-2A (Each to have): Doors: 139 (Single doors at interior)

| | | | | |
|---|---|---|---|---|
| 1. | S | 1 | Hinges | 662HD |
| 2. | T | 1 | Sets Push/Pull Bars | 1738x(2) 1741xType N Mounting |
| 3. | S | 1 | Auto Operator | D4990 |
| 4. | S | 1 | Closer | D3551 |
| 5. | T | 1 | Stops | 7280 |
| 6. | S | 1 | Activate Buttons | CL4990 |

F. HW-3 (Each to have): Doors: 25, 28, 29, 33, 34, 36, 40, 41, 43, 46, 69, 70, 78, 108, 109, 111, 114, 117, 135, 138 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 1 | Hinge | 662HD |
| 2. | A | 1 | Deadlock | MS1850S |
| 3. | B | 1 | Cylinder | |
| 4. | B | 1 | Thumbturn Cylinder | 1EA6A |
| 5. | T | 1 | Set Push/Pull Bars | 1737x(2) 1741xType N Mounting |
| 6. | S | 1 | Closer | D3551-H |
| 7. | T | 1 | Stop | 1270WX |

G. HW-4 (Each pair to have): Doors: 118, 141, 154 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | P | 2 | Panic Devices | 2603 |
| 3. | B | 2 | Cylinders | |
| 4. | T | 2 | Pulls | 1191-4 |
| 5. | S | 2 | Closers | D3551 TJ |
| 6. | T | 2 | Stops | 7281 |
| 7. | NG | 1 | Threshold | 425HD x WS/PA |
| 8. | NG | 2 | Door Bottoms | 200S |
| 9. | NG | 1 | Set Gasketing | 5075 |

H. HW-5 (Each to have): Doors: 144, 145 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 1 | Hinge | 662HD |
| 2. | P | 1 | Panic Device | 2408 x 2908D |
| 3. | B | 1 | Cylinder | |
| 4. | T | 1 | Pull | 1191-4 |
| 5. | S | 1 | Closer | D3551 TJ |
| 6. | T | 1 | Stop | 7281 |
| 7. | NG | 1 | Threshold | 425HD x WS/PA |
| 8. | NG | 1 | Door Bottom | 200S |
| 9. | NG | 1 | Set Gasketing | 5075 |

I. HW-6 (Each pair to have): Doors: 128 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | T | 2 | Sets Push/Pull Bars | 1737x(2) 1741xType N Mounting |
| 3. | S | 2 | Closers | 3551-H |
| 4. | T | 2 | Stops | 7280 |

J. HW-7 (Each pair to have): Doors: NOT USED (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | A | 1 | Deadlock | MS1850S |
| 3. | B | 1 | Cylinder | |
| 4. | B | 1 | Thumbturn Cylinder | 1EA6A |
| 5. | T | 2 | Flush Bolts | 3917-12" |
| 6. | T | 2 | Sets Push/Pull Bars | 1737x(2) 1741xType N Mounting |
| 7. | S | 2 | Closers | D3551 |
| 8. | T | 2 | Stops | 1270WX |
| 9. | NG | 1 | Threshold | 425HD x WS/PA |
| 10. | NG | 2 | Door Bottoms | 200S |
| 11. | NG | 1 | Set Gasketing | 5075 |

K. HW-8 (Each pair to have): Doors: 66, 151, 152, 153 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | A | 1 | Deadlock | MS1850S |
| 3. | T | 2 | Flush Bolts | 3917-12" |
| 4. | B | 1 | Cylinder | |
| 5. | B | 1 | Thumbturn Cylinder | 1EA6A |
| 6. | T | 2 | Sets Push/Pull Bars | 1737x(2) 1741xType N Mounting |
| 7. | S | 2 | Closers | 3551-H |
| 8. | T | 2 | Stops | 1270WX |

L. HW-9 (Each to have): Doors: OH1 thru OH12 (Overhead Doors)

| | | | | |
|---|---|---|---|---|
| 1. | B | 1 | Padlock | 11B7-22-L-M1 |
| 2. | Note: Balance of hardware by door manufacturer. | | | |

M. HW-10 (Each to have): Doors: 74, 77, 89, 90, 91, 92, 116, 146, 185A, 185B (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 1 | Hinge | 662HD |
| 2. | P | 1 | Panic Device | 2108 x V4908D |
| 3. | B | 1 | Cylinder | |
| 4. | S | 1 | Closers | D3551CS x SNB |
| 5. | T | 1 | Kick Plate | 10 x DW-1.5" |
| 6. | T | 1 | Stop | 7281 |
| 7. | NG | 1 | Threshold | 425HD-RCE x WS/PA |
| 8. | NG | 1 | Door Bottom | 200S |
| 9. | NG | 1 | Set Gasketing | 5075 |
| 10. | NG | 1 | Rain Drip | 16 DW+4" |

N. HW-11 (Each pair to have): Doors: 88, 93 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | B | 1 | Lock | 93K7 D 14D |
| 3. | T | 2 | Flush Bolts | 3917-12" |
| 4. | AB | 2 | O.H. Stop & Holders | 901_ x SNB |
| 5. | NG | 1 | Threshold | 425HD-RCE x WS/PA |
| 6. | NG | 2 | Door Bottoms | 200S |
| 7. | NG | 1 | Set Gasketing | 5075 |

O. HW-12 (Each pair to have): Doors: 84 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | Hinges | 662HD |
| 2. | B | 1 | Lock | 93K7 D 14D |
| 3. | T | 2 | Flush Bolts | 3917-12" |
| 4. | T | 2 | Stops | 1270WX |
| 5. | NG | 1 | Threshold | 425HD-RCE x WS/PA |
| 6. | NG | 2 | Door Bottoms | 200S |
| 7. | NG | 1 | Set Gasketing | 5075 |

P. HW-13 (Each to have): Doors: 85 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 1 | Hinge | 662HD |
| 2. | B | 1 | Lock | 93K7 D 14D |
| 3. | T | 1 | Stop | 1270WX |
| 4. | NG | 1 | Threshold | 425HD-RCE x WS/PA |
| 5. | NG | 1 | Door Bottom | 200S |
| 6. | NG | 1 | Set Gasketing | 5075 |

Q. HW-14 (Each pair to have): Doors: 32, 42 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 2 | hinges | 662HD |
| 2. | T | 2 | Pulls | 1191-3 |
| 3. | T | 2 | Push Plates | 1001-3 |
| 4. | S | 2 | Closers | D3551-H x SNB |
| 5. | T | 2 | Kick Plates | 10 x DW-1" |
| 6. | T | 2 | Stops | 7280 |

R. HW-15 (Each to have): Doors: NOT USED (Single Door)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Deadlock | 48H-7-K |
| 3. | T | 1 | Pull | 1191-3 |
| 4. | T | 1 | Push Plate | 1001-3 |
| 5. | | 1 | Auto Operator | |
| 6. | T | 1 | Kick Plate | 10 x DW-1.5" |
| 7. | T | 1 | Stop | 1270WX |

S. HW-16 (Each pair to have): Doors 98 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 6 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | T | 1 | Pr. Auto Latch Bolts | 3825L x 3815L |
| 4. | T | 1 | Coordinator | 3094 |
| 5. | S | 2 | Closers | D3551 x SNB |
| 6. | T | 2 | Kick Plates | 10 x DW-1" |
| 7. | T | 2 | Stops | 1270WX |
| 8. | NG | 1 | Threshold | 425HD-RCE |
| 9. | NG | 2 | Door Bottoms | 200S |
| 10. | NG | 1 | Set Gasketing | 5075 |

T. HW-17 (Each pair to have): Doors 87, 143 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 6 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | T | 1 | Pr. Auto Flush Bolts | 3820 x 3810 or 3825L x 3815L |
| 4. | T | 1 | Coordinator | 3094 |
| 5. | S | 2 | Closers | D3551 x SNB |
| 6. | T | 2 | Stops | 1270WX |

U. HW-18 (Each to have): Doors: 50, 142 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | S | 1 | Closer | S3551 x SNB |
| 4. | T | 1 | Kick Plate | 10 x DW-1.5" |
| 5. | T | 1 | Stop | 1270WX |

V. HW-19 (Each pair to have): Doors: 3, 16, 17, 55, 73, 81, 94, 106, 121, 123, 131, 147, 148, 149, 150 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 6 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | T | 2 | Flush Bolts | 3917-12" |
| 4. | NG | 1 | Astragal | 552 or 562SS |
| 5. | T | 2 | Stops | 1270WX |

W. HW-20 (Each to have): Doors: 4 thru 12, 26, 27, 47, 60 thru 65, 72, 99, 100, 105, 113, 132, 133, 134 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 AB 14D |
| 3. | T | 1 | Stop | 1270WV |

X. HW-21 (Each to have): Doors: 13, 14, 19, 23, 24, 30, 31, 35, 37, 38, 39, 44, 45, 51, 57, 75, 76, 112, 115 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | T | 1 | Stop | 1270WX |

Y. HW-21A (Each to have): Doors: 71, 107, 110 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | T | 1 | Stop | 1270WX |
| 4. | NG | 1 | Threshold | 425HD-RCE |
| 5. | NG | 1 | Door Bottoms | 200S |
| 6. | NG | 1 | Set Gasketing | 5075 |

Z. HW-22 (Each to have): Doors: 15, 18, 21, 22, 58, 59, 79, 80, 95, 96, 103, 104, 129, 130, 137, (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | T | 1 | Pull | 1191-3 |
| 3. | T | 1 | Push Plate | 1001-3 |
| 4. | S | 1 | Closer | D3551 x SNB |
| 5. | T | 1 | Kick Plate | 10 x DW-1.5" |
| 6. | T | 1 | Stop | 1270WX |

AA. HW-23 (Each to have): Doors: 20, 56, 84A, 86, 101, 102, 136 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | S | 1 | Closer | D3551 x SNB |
| 4. | T | 1 | Stop | 1270WX |

BB. HW-24 (Each pair to have): Doors: 53, 97 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 6 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | T | 2 | Flush Bolts | 3917-12" |
| 4. | S | 1 | Closer | D3551-H x SNB |
| 5. | T | 2 | Kick Plates | 10 x DW-1" |
| 6. | T | 2 | Stops | 1270WX |

CC. HW-25 (Each to have): Doors: 52, 54 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Lock | 93K7 R 14D |
| 3. | S | 1 | Closer | D3551-H x SNB |
| 4. | T | 1 | Kick Plate | 10 x DW-1.5" |
| 5. | T | 1 | Stop | 1270WX |

DD. HW-26 (Each to have): Doors: 119, 120 (Single Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 3 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Deadlock | 48H7-K |
| 3. | T | 1 | Pull | 1191-3 |
| 4. | T | 1 | Push Plate | 1001-3 |
| 5. | S | 1 | Closer | D3551-H x SNB |
| 6. | T | 1 | Kick Plate | 10 x DW-1.5" |
| 7. | T | 1 | Stop | 1270WX |

EE. HW-27 (Each pair to have): Doors: 124, 125, 126 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 6 | Butts | FBB179 4.5 x 4.5 |
| 2. | P | 2 | Panic Devices | 2208 x 4908D LBR x SNB |
| 3. | B | 2 | Cylinders | |
| 4. | S | 2 | Closers | D3551-H x SNB |
| 5. | T | 2 | Kick Plates | 10 x DW-1" |
| 6. | T | 2 | Stops | 1270WX or 7280 |

FF. HW-28 (Each pair to have): Doors: 127 (Double Doors)

| | | | | |
|---|---|---|---|---|
| 1. | S | 6 | Butts | FBB179 4.5 x 4.5 |
| 2. | B | 1 | Deadlock | 48H7 R x WBX |
| 3. | T | 2 | Flush Bolts | 3917-12" |
| 4. | T | 2 | Pulls | 1191-3 |
| 5. | T | 2 | Push Plates | 1001-3 |
| 6. | S | 2 | Closers | D3551-H x SNB |
| 7. | T | 2 | Kick Plates | 10 x DW-1" |
| 8. | T | 2 | Stops | 1270WX |

**END OF SECTION**

# SECTION 08801
# GLASS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Glass.

B. Glazing compounds and accessories.

### 1.2 RELATED SECTIONS:

A. Section 07900 - Joint Sealers: Sealant and back-up material.

B. Section 08211 - Flush Wood Doors: Glazed doors.

C. Section 08410 - Metal-Framed Storefronts.

D. Section 10800 - Toilet Accessories: Mirrors.

### 1.3 REFERENCES:

A. ANSI 297.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test.

B. ASTM C 162 - Standard Terminology of Glass and Glass Products.

C. ASTM C 773 - Standard Test Method for Compressive (Crushing) Strength of Fired Whiteware Materials.

D. ASTM C 774 - Standard Test Method for Yield Strength of Enameling Steels After Straining and Firing.

E. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

F. ASTM C 1036 - Standard Specification for Flat Glass; 1991.

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

H. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass.

I. ASTM C 1193 - Standard Guide for Use of Joint Sealants.

J. ASTM C 1249 - Structural Glazing

K. ASTM C 1376 - Standard Specifications for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

L. ASTM C 1401 - Structural Glazing.

M. 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.

N. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

O. ASTM E 1300 - Standard Practice for Determining the Minimum Thickness and type of Glass Required to Resist a Specified Load.

P. ASTM E 2188 - Standard Test method for Insulating Glass Unit Performance.

Q. ASTM E 2189 - Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.

R. ASTM E 2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation.

S. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

T. GANA - Engineering Standards Manual.

U. GANA (GM) - FGMA Glazing Manual; Glass Association of North America.

V. GANA (SM) - FGMA Sealant Manual; Glass Association of North America.

W. GANA (LGDG) - Laminated Glass Design Guide; Glass Association of North America.

## 1.4 PERFORMANCE REQUIREMENTS:

A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier.
   1. In conjunction with materials described in Section 07900.
   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.

B. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures of 15 lb/sq. ft. positive and negative or as recommended by manufacturer for intended application shown on drawings, whichever is more stringent.
   1. Test in accordance with ASTM E 330.
   2. Limit glass deflection of 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Thicknesses listed are minimum.

## 1.5 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Manufacturer's data sheets on each product to be used, including:
   1. Glazing, Glazing compounds, Glazing accessories.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Verification Samples:
   1. Flat Glass Materials: Two 4" x 4" samples of each glass type specified.

D. Certificates: Product certificates signed by the manufacturer certifying material compliance with specified performance characteristics and criteria and physical requirements.

E. Warranty documents specified herein.

**1.6 DELIVERY, STORAGE AND HANDLING:**

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

B. Store and dispose and solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Refer to manufacturer's guidelines for storage and handling.

D. Refer to manufacturer's recommendations for cleaning of glass products.

**1.7 PROJECT CONDITIONS:**

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Field Measurements: When construction schedule permits, verify field measurements with drawing dimensions prior to fabrication of glass product.

**1.8 WARRANTY:**

A. See Section 01780 - Closeout Submittals for additional warranty requirements.

B. Provide a ten (10) year warranty to include replacement of sealed glass units exhibiting seal failure, interpane dusting or misting.

**PART 2 - PRODUCTS**

**2.1 FLAT GLASS MATERIALS:**

A. Manufacturers:
1. **PPG Industries, Inc, 400 Guys Run Road, Cheswick, PA 15024, 1-888-774-4332,** www.ppgideascapes.com
2. AGC Glass Company
3. Guardian Sunguard, Guardian Industries Group.
4. Substitutions: Refer to Section 01600 - Product Requirements.

B. Materials:
1. Safety Glass (Type FG-A): Clear, fully tempered, 1/4" thick
   a. Laminated with 0.015 inch thick plastic interlayer; comply with ASTM C 1172.
2. Mirror Glass (Type FG-C): Clear tempered with copper and silver coating, organic overcoating, square and lapped edges, 1/4" thick.
   a. Sizes as indicated on drawings.
3. One-Way Glazing:
   a. 1/4" plate glass with one-way viewing - submit for approval by Architect.

**2.2 SEALED INSULATING GLASS MATERIALS:**

A. Manufacturers:
1. **PPG Industries, Inc, 400 Guys Run Road, Cheswick, PA 15024, 1-888-774-4332,** www.ppgideascapes.com
2. Substitutions: Refer to Section 01600 - Product Requirements.

B. Materials: Insulated Glass Units (Type Low-E): Double pane with glass to elastomer edge seal; Total unit thickness of 1 inch minimum.
1. "Solarban 60 (2), Control Low-E, Solargray + Clear".
2. Performance Data:
   a. Transmittance:
      1) Ultra Violet: 8%
      2) Visible: 359%
      3) Solor Energy: 18%
   b. Reflectance:
      1) Visible Light: 6%
      2) Solar Energy: 12%
   c. U-Values
      1) Winter - Night: 0.29
      2) Summer - Day: 0.27
   d. Other Values
      1) Solar Heat Gain Coefficient: 0.25
      2) Shading Coefficient: 0.29

C. AGC - "Energy Select 25".

D. Guardian "CrystalGray or CrystalBlue".

## 2.3 GLAZING ACCESSORIES:

A. Manufacturers:
1. Tremco.
2. Substitutions: Refer to Section 01600 - Product Requirements.

B. Accessories as applicable for glazing type and specific installation including:
1. Setting Blocks: ASTM C 864, Neoprene, 80 to 90 Shore A durometer hardness, Length 4 inches, width of glazing rabbet space minus 1/16 inch x height required for glazing method and pane weight and area.
2. Spacer Shims: ASTM C 864, Neoprene, 50 to 60 Shore A durometer hardness; length 3 inches, one half height of glazing stop, thickness required for application, one face self-adhesive.
3. Glazing Tape: Butyl compound tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, black color, coiled on release paper; widths required for specified installation.
4. Glazing Splines: ASTM C 864, resilient polyvinyl chloride, extruded shape to fit glazing channel retaining slot; black color.
5. Glazing Gaskets: ASTM C 864, resilient polyvinyl chloride, extruded shape to fit glazing channel retaining slot; black color.
6. Glazing clips: Manufacturer's standard type.
7. Sealants: Specified in Section 07900.

## 2.4 FABRICATION:

A. Acceptable Fabricators:
1. PPG Industries, Inc.
2. Substitutions: Refer to Section 01600 - Product Requirements.

B. Heat-Strengthened Glass:
1. Cut float glass materials to indicated sizes and provide cut-outs and holes, if indicated, before heat strengthening.
2. Heat strengthen float glass materials in accordance with ASTM C 1048, Kind HS.

C. Tempered Glass:
1. Cut float glass materials to indicated sizes and provide cut-outs and holes, if indicated, before heat strengthening.
2. Fully temper float glass materials in accordance with ASTM C 1048, Kind FT.

D. Laminated Glass:
1. Cut float glass materials to indicated sizes and provide cut-outs and holes in accordance with ASTM C 1172, if indicated.
2. Heat strengthen or fully temper float glass materials in accordance with ASTM C 1048, Kind HS or FT, if indicated.
3. Laminate plastic interlayer between glass panes in accordance with ASTM C 1172.
4. Laminate glass to conform to GANA (LGDG), 16 CFR Part 1201 Cat. 1 and 2 and requirements of ANSI 297.1

E. Sealed Insulated Glass Units:
1. Fabricate units in accordance with ASTM E2188, 2189, 2190 - Standard Specifications for Insulating Glass Unit Performance and Evaluation with components and performance characteristics specified in Schedules Article of this section.
2. Provide unit edge seals meeting requirements of ASTM E 773 with sealant for glass-to-spacer seals.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify that openings for glazing are correctly sized and within tolerances.

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.

### 3.2 PREPARATION:

A. Clean contact surfaces to receive sealant with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces to receive sealant in accordance with sealant manufacturer's instructions.

### 3.3 INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Install coated monolithic glass with coated surface to exterior (Surface 1).

C. Install sealants in accordance with Section 07900.

D. Exterior Dry Method (Tape and Gasket Spline):
1. Apply glazing tape or spline to glass; butt-joint tape edges; seal joints with butyl sealant.
2. Place setting blocks with edge blocks maximum 6 inches form glass edges and

intermediate blocks at 1/4 points of glass panel length.

3. Set glass unit on setting blocks; apply pressure against fixed stop for full contact.
4. Install removable stops without displacing glazing tape or spline; apply pressure for full continuous contact.
5. Trim sight-exposed tape flush with stop.

E. Installation of glazing in wood borrowed-lite partitions is specified in Section 06200.

F. Installation of glazing in steel doors and borrowed-lite partitions is specified in Seciton 08110.

G. Installation of glazing in flush wood doors is specified in Section 08211.

H. Installation of glazing in aluminum entrances and storefronts is specified in Section 08410.

**3.4 CLEANING:**

A. Remove glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean glass and adjacent surfaces.

**3.5 PROTECTION OF FINISHED WORK:**

A. Protect installed products until completion of project.

B. After installation, mark pane with a "X" by using removable plastic tape or paste. Remove tape or paste prior to final punch.

C. Repair or replace damaged products before Substantial Completion.

**3.6 SCHEDULES:**

A. See Drawings.

**END OF SECTION**

# SECTION 09260
# GYPSUM BOARD ASSEMBLIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Gypsum sheathing.

B. Gypsum wall board.

C. Joint treatment and accessories.

### 1.2 RELATED SECTIONS INCLUDE:

A. Section 05400 - Lightgage metal Framing

B. Section 07212 - Board and Batt Insulation.

C. Section 09835 - Textured Multi-Color and Metallic Wall Finishes

D. Section 09900 - Paint and Coatings

E. Section 11132 - Projection Screens

### 1.3 REFERENCES:

A. ASTM C 36/C 36 M - Standard Specification for Gypsum Wallboard; 1999.

B. ASTM C 79/C 79M - Standard Specification for Treated Core and Non-treated Core Gypsum Sheathing Board; 1997.

C. ASTM C 442/C 442M - Standard Specification for Gypsum Backing Board, Gypsum Core board, and Gypsum Shaft liner Board; 1999a.

D. ASTM C 475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 1994.

E. ASTM C 557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 1999.

F. ASTM C 630/C 630M - Standard Specification for Water-Resistant Gypsum Backing Board; 1996a.

G. ASTM C 645 Standard Specification for Non-Structural Steel Framing Members; 1999.

H. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1998.

I. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 1999a.

J. ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board; 1999.

K. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2000.

L. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories, Inc.; current edition.

**1.4 SUBMITTALS:**

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing.

C. Product Data: Provide data on metal framing.

**1.5 QUALITY ASSURANCE:**

A. Applicator Qualifications: Company specializing in performing the work of this section and approved by manufacturer.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS:**

A. United States Gypsum.

B. Gold Bond.

C. Georgia Pacific.

D. Clark Dietrick Building Systems

E. Substitutions: Refer to Section 01600 - Product Requirements.

**2.2 GYPSUM BOARD MATERIALS:**

A. Standard Non-Rated and Fire-Rated Gypsum Wall Board: ASTM C 36/C 36M; sizes to minimize joints in place; ends square cut.
1. Thickness: 5/8 inch.
2. Edges: Tapered.

B. Gypsum Sheathing Board: ASTM C 79/C 79 M; moisture resistant type ; sizes to minimize joints in place; water resistant paper faces; ends square cut.
1. Thickness: ½ inch.
2. Edges: Square.

C. Cementitious Backer Board: High density, glass fiber reinforced, ½ inch thick.
1. Tape: 2 inch wide, coated glass fiber type for joints and corners.

**2.3 ACCESSORIES:**

A. Corner Beads: Metal. Dur-A-Bead Model 104. Metal and paper combination for angled corners other than 90 degrees.

B. Corner Beads: Galvanized steel.

C. Edge Trim: U bead, as defined in ASTM C 840.

D. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.

E. Screws: ASTM C 1002; self-drilling type; cadmium-plated for exterior locations.

**2.4 STUDS AND TRACKS (INTERIOR):**

A. All interior studs shall be a minimum of 20 gage unless notes otherwise on plans.

B. Tracks shall match size and gage of metal studs.

C. All interior stud framing (gauges and depth of frame) that is 12 foot or less shall comply with manufacturer's recommended sizing properties.

D. Refer to Section 05400 and table specified on drawings for interior studs greater than 12 feet and for all exterior studs.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify that project conditions are appropriate for work of this section to commence.

**3.2 GYPSUM BOARD INSTALLATION:**

A. Comply with ASTM C 840. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Single-Layer Fire-Rated: Install gypsum board vertically, with edges and ends occurring over firm bearing.

D. Gypsum Sheathing: Install horizontally, with edges butted tight and ends occurring over firm bearing.

E. Installation on Metal Framing: Use screws for attachment of all gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

F. Moisture Protection: Tread cut edges and holes in moisture resistant gypsum board and exterior gypsum soffit board with sealant.

**3.3 INSTALLATION OF TRIM AND ACCESSORIES:**

A. Control Joints: Place control joints consistent with lines of building spaces and as directed.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

**3.4 METAL STUD INSTALLATION:**

A. Studs shall be spaced at a maximum of 16 inches on center.

B. Studs shall be anchored to floor with power-actuated fasteners no more than 12 inches on center.

C. Attach studs to tracks with two screws.

D. Install horizontal bridging of 54 mil. "U" channel in stud system, spaced no more than 48 inches

on center vertically.

**3.5 JOINT TREATMENT:**

A. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840.

**3.6 TOLERANCES:**

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

**3.7 FINISH LEVEL SCHEDULE:**

A. Level 2: Utility areas and areas behind cabinetry.

B. Level 3: Walls scheduled to receive textured wall finish.

C. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish or Multicolor Wall Finish.

D. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

**3.8 SCHEDULE:**

A. See drawings for location of types of wall board.

**END OF SECTION**

# SECTION 09301
# PORCELAIN TILE

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Tile for base and wall applications. (See drawings for patterns on walls)

B. Construction/Movement Joints as needed/required.

### 1.2 REFERENCES:

A. Comply with current editions and applicable specifications of the following:
   1. American Society for Testing and Materials (ASTM).
   2. American National Standards Institute (ANSI).
   3. Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate tile layout, and setting details.

C. Product Data: Provide instructions for using grouts.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

### 1.4 QUALITY ASSURANCE:

A. Maintain one copy of latest TCA Handbook and ANSI A108 Series/A118 Series on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 5 years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.

### 1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

### 1.6 ENVIRONMENTAL REQUIREMENTS:

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient & substrate temperature of 50 degrees F. during installation of mortar materials.

### 1.7 EXTRA MATERIALS:

A. Provide 100 sq. ft. of each size, color and surface finish of tile specified.

## PART 2 - PRODUCTS

**2.1 TILE:**

A. Manufacturers:
1. StonePeak Ceramics, Inc., Chicago, IL www.stonepeakceramics.com
2. Substitutions: See Section 01600 - Product Requirements.

B. Unglazed Porcelain Tile: ANSI A137.1 1988 and as follows:
1. Parkland Collection and Sky Collection - Stonepeak
2. Moisture Absorption: 0.10 percent.
3. Size and Shape:
   a. 6" x 24" (Walls): See drawings and Color Placement Schedule for locations, colors and patterns.
4. Edges: Rectified.
5. Surface Finish: Unglazed, Thru-color finish.
6. Colors: See Section 00860 - Color Placement Schedule and drawings for locations and patterns.
7. Grout width: 3/32"

**2.2 SETTING AND GROUTING MATERIALS:**

A. Mortar: Latex modified thin set per Manufacturer's recommendations and appropriate installation methods according to ANSI A118-1999 series or A136.1-1999.

B. Grout: Use grout per manufacturer's recommendations and ANSI A118 - 1999. Submit to architect for approval and color selection.

C. Organic Adhesive: If required per ANSI A136.1.

**2.3 EXPANSION JOINTS, CONTROL, CONTRACTION, PERIMETER, AND ISOLATION JOINTS:**

A. Refer to most current TCA Handbook, Method EJ171-03 for recommendations on locating, treating and detailing various types of construction joints.

B. Use sealant complying with ASTM C920 according to Type, Grade, Class and Uses required.

C. Prefabricated expansion joints can also be used when suitable for installation and approved by Architect.

D. Provide construction/contraction joints, perimeter joints and expansion joints as indicated on the drawings. Final location of tile joints shall be field verified and approved by the Architect prior to installation of tile.

**2.4 ACCESSORY MATERIALS:**

A. Construction and Movement Joints (CJ): joints placed as recommended by TCA Handbook and as shown on Floor Pattern Layout drawing.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces.

B. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile.

C. Do not proceed with installation until unsatisfactory conditions have been corrected. Commencement of work signifies acceptance of substrate and installation conditions.

**3.2 PREPARATION:**

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Remove protrusions, bumps and ridges by grinding or chipping.

D. Repair, fill and level cracks, holes, depressions and rough or chipped areas in substrate using patching materials recommended by setting materials manufacturer.

E. Ensure that the substrate is within the manufacturer's recommended tolerances.

F. Jobsite Blending: Blend tiles before installing in accordance with reference standards to produce an even range and distribution of color and finish.

**3.3 INSTALLATION - GENERAL:**

A. Install tile, construction/movement joints and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners neatly. Align floor joints.

C. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

D. Form internal angles square and external angles bullnosed.

E. Sound tile after setting. Replace hollow sounding units.

F. Keep expansion joints free of adhesive or grout unless otherwise indicated.

G. Allow tile to set for a minimum of 48 hours prior to grouting.

H. Grout tile joints. Use standard grout unless otherwise indicated.

I. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar plane.

**3.4 INSTALLATION - WALL TILE:**

A. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated or recommended by manufacturer.

B. Wall Tile Patterns:
1. See Millwork drawing sheet for wall pattern details at restrooms.

**3.5 CLEANING AND PROTECTION OF FINISHED WORK:**

A. Clean tile and grout surfaces.

B. After cleaning, provide protective covering and maintain conditions to protect tile form damage or deterioration. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, and during move-in of furniture and equipment, cover protective covering with 1/4" hardboard, plywood or similar material.

C. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

D. Consult manufacturer's information for post installation cleanup and routine maintenance.

E. Do not permit traffic over finished floor surface for 4 days after installation.

**3.6 SCHEDULE:**

A. See Section 00860 - Color Placement Schedule and drawings..

**END OF SECTION**

# SECTION 09302
# LARGE FORMAT PORCELAIN TILE PANELS

## PART 1 - GENERAL:

### 1.1 SECTION INCLUDES:

A. Thin porcelain tiles, setting mortars, adhesives, accessories and trim.

B. Grout for thin porcelain tiles.

### 1.2 REFERENCES:

A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.

B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile.

C. TCNA (HB) - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America.

D. ISO 13007 - International Standards Organization; classification for Grout and Adhesives.

### 1.3 SUBMITTALS:

A. Submit under provisions of Section 01300 - Submittals.

B. Product Data: Manufacturer's technical information for each product specified.

C. Samples: Provide the following submittals before starting any work of this Section:
   1. Samples for Selection: Submit one (1) sample 50mm x 175mm (2 " x 7") of each type of Laminam 5.6 thin porcelain tile showing color.

D. Installation Instructions: Manufacturer's printed Technical Manual / Guidelines.

E. Care and Maintenance: Crossville Inc.'s "How to Care" Brochure

### 1.4 QUALITY ASSURANCE:

A. Obtain each type and color of Laminam5.6 from Crossville Inc. or its distributor.

B. To ensure compatibility of products; please provide all grout, setting materials, additives, accessories, and factory-prepared dry-set mortars from the same manufacturer.

C. Installer Qualifications:
   1. The use of trained professional contractors for the installation of these thin porcelain tiles is required. In addition, the installer must also have obtained completion of Crossville Sponsored Training provided by Crossville Inc., a Crossville distributor, or other thin-tile specific training authorized/approved by one of the organizations listed below.

### 1.5 PRE INSTALLATION CONFERENCE:

A. Convene one week prior to commencing work of this section

B. Require attendance of installation material manufacturer, tile supplier, tile installer and installers of related work.

C. Review installation procedures and coordination required with related work. Meeting agenda includes but is not limited to:
   1. Surface preparation
   2. Thin Porcelain Tile installation procedure
   3. Grouting material and procedure
   4. Cleaning products and maintenance

**1.6 DELIVERY, STORAGE AND HANDLING:**

A. Follow Crossville's written guidelines for handling. Incorporate all necessary tools as detailed in the following guidelines and Crossville's Technical Manual / Guidelines (most current revision found at www.laminambycrossville.com)

1. Handling of the crate – recommend 44" forks to handle the crate from the side. Important to have 44" forks so they extend all the way across the crate to catch the back runner.

2. Shipments of the Laminam 5.6 crates loaded with the narrow end of the crate facing out will require a fork truck with a minimum of 84" forks and 5000 pound lift capacity.

3. To correctly lift and handle thin porcelain tiles using a forklift, position the forks at a distance of at least 3.3 feet (1 meter) from each other, perpendicular to the long side of the pallet and at the center of the pallet.

4. Thin porcelain tiles to be stored both upright and horizontal. If slabs are placed on top of each other, ensure that each tile is clean and that the surface that the tiles are resting on is flat. If tiles are stored in their vertical position, rest them on their long side. This side must be protected by wood, cardboard, or Styrofoam.

5. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes and in accordance with written manufacturer's recommendations.

**1.7 EXTRA MATERIALS STOCK:**

A. Upon completion of the work of this section, deliver to the owner 5% minimum additional panels of each type, color, pattern and size used in the work, as well as extra stock of adhesives, mortars, grouts and other installation materials for the owner's use in replacement and maintenance. Extra stock is to be from same production run or batch as original tile and installation materials.

**1.8 ENVIRONMENTAL REQUIREMENTS:**

Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.

A. For interior applications:
   1. Do not begin installation until building is completely enclosed and HVAC system is operating and maintaining temperature and humidity conditions consistent with "after occupancy" conditions for a minimum of 2 weeks.
   2. Maintain continuous and uniform building temperatures of not less than 10°C (50°F) during installation.
   3. Ventilate spaces receiving tile in accordance with material manufacturer's

instructions.

## PART 2 - PRODUCTS

### 2.1 TILE MANUFACTURERS:

A. Crossville, Inc.; 349 Sweeney Drive; Crossville, TN 38555; website: http://laminambycrossville.com

### 2.2 WALL TILE MATERIALS – Interior walls:

A. Porcelain Tile: LAMINAM 5.6 mm

B. Size: 1M x 3M (39.4" x 118.1")

C. Style: Urban Influence - Satori

D. Color: See Spec Section 00860 - Interior Color Schedule

E. Location: See drawings and specifications.

### 2.3 INSTALLATION MATERIALS MANUFACTURER:

A. Acceptable Manufacturers:
1. Bostik Inc., www.bostik-us.com, 800-523-6530
2. Laticrete International, www.laticrete.com, 800-243-4788
3. ProSpec Inc., www.prospec.com, 800-334-0784

B. Substitutions: Not permitted.

### 2.4 SURFACE PREPARATION, MORTAR, GROUT, AND SEALANT MATERIALS:

F. Refer to Crossville's Technical Manual / Guidelines for specific surface preparation, mortar, grout, and sealant selections.

### 2.5 METAL TRIM:

A. Manufacturer: Schluter Systems www.schluter.com

B. Jolly #A60ABGB
1. Description: L-shaped profile with 1/4" (6 mm) wide top section and vertical wall section that together form the visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
2. Anchoring Leg:
   a. Provide with straight anchoring leg
3. Material and Finish:
   a. ABGB - Brushed Antique Bronze Anodized Aluminum

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify that surfaces to be covered with large format, thin porcelain tiles are:
1. Sound, rigid and conform to good design/engineering practices; Systems, including the framing system and panels, over which porcelain panels will be installed shall be in conformance with the International Building Code (IBC) for commercial applications, or applicable building codes (floor systems over which the tile will be installed should not exceed L/360 under live load).
2. Clean and free of dust, dirt, oil, grease, sealers, curing compounds, laitance, efflorescence, form oil, loose plaster, paint, and scale.

3. For thin-bed porcelain tile installations when a cementitious bonding material will be used, including large and heavy tile mortar: maximum allowable variation in the tile substrate is 1/8" in 10' (3mm in 3m) from the required plane, with no more than 1/16" variation in 24" (1.5mm variation in 600mm) when measured from the high points in the surface. For modular substrate units, such as adjacent concrete masonry units, adjacent edges cannot exceed 1/32" (0.8mm) difference in height.
4. Examine substrates for compliance with requirements for conditions affecting performance of the work. Refer to ANSI A108.01; General requirements for sub-surfaces and preparations by other trades materials.

B. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard and Crossville's Technical Manual / Guidelines.

C. Tile contractor by commencing work assumes overall responsibility to assure that all components and parts shown or required within the installation comply with contract documents and are compatible with each other and with the conditions and expected use. Commencement of work signifies acceptance of substrate and installation conditions.

## 3.2 INSTALLATION:

A. Install thin porcelain tiles in accordance with manufacturer's printed instructions
1. Crossville, Inc.; Technical Manual / Guidelines for Laminam Thin Porcelain Tiles.

B. Install thin porcelain tiles in accordance with applicable requirements of ANSI A108 Series for the materials being used.

C. Install expansion and control joints in accordance with TCNA method EJ171. Movement joints in the substrate must not be bridged with the thin porcelain tile.

D. Interior walls:
1. For interior walls an 1/8 inch movement joint installed every 20 feet will accommodate the needed movement of the tile layer on grade, below grade, or above grade

## 3.3 GROUTING:

A. Grout joints in accordance with manufacturer's instructions and ANSI A108.10 or ANSI A108.6.

B. Following the installation of the thin porcelain tiles, grout application times can vary from 24 hours to 72 hours; refer to specific guidelines per the grout manufacturer.

C. WALLS
1. 2mm to 3mm grout joint size is recommended based on wall flatness.
2. Use of commercially available sanded, unsanded or epoxy grout is acceptable, appropriate caulking material is also acceptable for wall installations.
3. Install and clean per manufacturer's instructions.

END OF SECTION

# SECTION 09511
# SUSPENDED ACOUSTICAL CEILINGS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Suspended metal grid ceiling system.

B. Acoustical Units.

C. Suspended "Cloud" - Axiom Vector grid system.

### 1.2 RELATED SECTIONS:

A. Section 05750 - Perforated Metal Panel: Suspended metal panels at ceiling.

### 1.3 REFERENCES:

A. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 1997.

B. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panel; 1996.

C. ASTM E 580 - Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Moderate Seismic Restraint; 1996.

D. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998.

### 1.4 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on suspension system components.

C. Samples:
1. Submit one sample 4 x 4 inch in size illustrating materials and finish of acoustical units.
2. Submit two samples each, 6 inches long, of suspension system main runner, cross runner, and perimeter molding.

### 1.5 QUALITY ASSURANCE:

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

### 1.6 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.

### 1.7 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.

**1.8 EXTRA MATERIALS:**

A. See Section 01600 - Product Requirements, for additional provisions.

**PART 2 - PRODUCTS**

**2.1 ACOUSTICAL UNITS:**

A. Manufacturers:
1. Armstrong
2. No Substitutions allowed for this section.

B. Acoustical Tile: ASTM E 1264, conforming to the following:
1. Size: 24 x 24 inches as shown on drawings.
2. Thickness: 5/8 inches.
3. Composition: Mineral.
4. Density: 1.3 lb/cu ft.
5. Edge: Square Lay-in
6. Surface Color: White
7. Surface Pattern: Non-directional fissured.
8. Product: Fine Fissured

**2.2 SUSPENSION SYSTEM(S):**

A. Manufacturers:
1. Armstong.
2. No Substitutions allowed for this section.

B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with clips, splices, perimeter moldings, and hold down clips as required.
1. Prelude 5/16" Exposed Tee Grid (at lay-in ceiling tile). Color to match acoustical ceiling tile.
2. Axiom Vector "Cloud" 4" height Trim. Color: White, submit for approval by Architect. See drawings for "Cloud" dimensions and locations

**2.3 ACCESSORIES:**

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirements specified.

B. Perimeter Moldings: Same material and finish as grid.
1. At exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.

D. Provided all trim accessories, etc. required to provide a finished product as desired by design intent.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

### 3.2 INSTALLATION - SUSPENSION SYSTEM:

A. Install suspension system in accordance with ASTM C 636, ASTM E580, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. 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.

F. 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.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. 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.

K. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

### 3.3 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 form 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.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Lay acoustical insulation for a distance of 48 inches either side of acoustical partitions.

I. Install hold-down clips on each panel, at all vestibules, lobbies and entrance halls for 20 feet, to retain panels tight to grid system; comply with fire rating requirements.

**3.4 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: 1 degree.

**3.5 SCHEDULE:**

A. Refer to the Reflected Ceiling Plan and Finish Schedule on Drawings and Color Placement Schedule in specifications.

**END OF SECTION**

# SECTION 09650
# MILLWORK RUBBER BASE AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Millwork Rubber Base.

B. Transition strips at dissimilar floor materials.

### 1.2 RELATED SECTIONS INCLUDE:

A. Section 09301 - Porcelain Tile

B. Section 09680 - Carpet

### 1.3 REFERENCES:

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1997a.

B. FS L-F-001641 - Floor Covering Translucent or Transparent Vinyl Surface with Backing; Federal Specifications and Standards; 1971, and Amendment 2, 1982.

C. FS L-F-475 - Floor Covering Vinyl, Surface (Tile and Roll) with Backing; Federal Specifications and Standards; Revision A, 1965, Amendment 1, 1965 and Amendment 3, 1982.

D. FS SS-T-312 - Tile, Floor: Asphalt, Rubber, Vinyl, and Vinyl Composition; Federal Specifications and Standards; Revision B, 1974, and Amendment 1, 1979.

### 1.4 SUBMITTALS:

A. See Section 01300 - Submittals, for submit procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plan.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit two samples, 12 x 12 inch in size illustrating color and pattern for each resilient flooring product specified.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping and re-waxing.

### 1.5 DELIVERY, STORAGE, AND PROTECTION:

A. Protect roll materials from damage by storing on end.

### 1.6 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.

**1.7 EXTRA MATERIALS:**

A. See Section 01600 - Product Requirements, for additional provisions.

B. Provide 100 sq. ft. of flooring, 40 lineal feet of base, of each type and color specified.

**PART 2 - PRODUCTS**

**2.1 MATERIALS - BASE:**

A. Manufacturers:
1. Johnsonite, Inc
2. Substitutions: See Section 01600 - Product Requirements

B. Millwork Resilient Wall Base: Meets performance requirements for ASTM F 1861 Standard Specification for Resilient Wall Base, Type TP, Group 1. Style and characteristics as follows:
1. Reveal 4.25" profile – 1/4" (6.35 mm) thick by 4.25" (10.8 cm) height wall base
2. Color: See Section 00860 - Color Placement Schedule.
3. ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm$^2$ or greater, Class I.
4. ASTM E 84, Standard Test Method for Surface Burning Characteristics of Building Materials, Class B, Smoke less than 450.

C. Installation Materials:
1. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based formulation manufactured and warranted by a reputable manufacturer.
2. Adhesives: as recommended by manufacturer to meet site conditions
   a. Johnsonite #960 Cove Base Adhesive (Porous applications)
   b. Johnsonite #946 Premium Contact Bond Adhesive (Non-porous applications)

**2.2 MATERIALS - TRANSITIONS (TS):**

A. Manufacturers:
1. Johnsonite, Inc
2. Substitutions: See Specification Section 01600 - Product Requirements

B. Rubber/Vinyl Accessories:
1. Transition between carpet and concrete: Johnsonite #CRS-XX-A 1/4" to 0" reducer. (TS)

C. See Floor Plan Drawings and Color Placement Schedule in specifications for locations and color selections.

**2.3 ACCESSORIES:**

A. Primers and Adhesives: Waterproof; types recommended by manufacturer.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify that wall surfaces are smooth and flat within tolerances specified in Section 09260, are dust-free, and are ready to receive resilient base.

**3.2 PREPARATION:**

A. 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.

B. Existing sub-floor may require additional preparation. See manufacturer's installation instructions and warranties.

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.

**3.3 INSTALLATION - BASE AND ACCESSORIES:**

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere Millwork resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. Millwork profiles – job-formed corners:
   1. Outside corners: Use straight pieces of maximum lengths possible and miter corners to fit.
   2. Inside corners: Butt one piece to corner then scribe next piece to fit.

**3.4 CLEANING AND PROTECTION:**

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
   1. Perform the following operations immediately after completing resilient product installation:
      a. Remove adhesive and other blemishes from exposed surfaces.
      b. Damp-mop surfaces to remove marks and soil.
   2. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

**3.5 SCHEDULE:**

A. Refer to Schedule 00860 - Color Placement Schedule.

**END OF SECTION**

# SECTION 09680
# CARPET

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Carpet, Modular, Plank, Releasable glue down

B. Accessories - Carpet Edge Transition Strip from Carpet to Concrete floor (TS): See Specification Section 09650 Millwork Rubber Base and Accessories for products specified.

### 1.2 REFERENCES:

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1999.

B. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 1996

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two samples 6.5 x 6.5 inch in size illustrating color and pattern for each carpet material specified.

D. Manufacturer's Installation Instructions: Indicate special procedures.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials and suggested schedule for cleaning.

### 1.4 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum five years documented experience.

### 1.5 ENVIRONMENTAL REQUIREMENTS:

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F. ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

D. Deliver all materials to the installation site in the manufacturer's original packaging and in good condition. Packaging to contain manufacturer's name and marks, identification number, shipping and handling instructions and related information.

E. Delivered and stored materials must be available for inspection as required by the owner, architect, general contractor and/or the manufacturer.

F. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document. Sub-floor preparation shall meet all conditions as specified in J+J Flooring Group's Kinetex textile composite flooring installation instructions.

G. Sub-floor preparation will include, as required, the removal and repair of the existing floor surface. It is required that the floor of a renovation project be inspected before the bid date.

H. All materials, including adhesives, are to be delivered to the site of installation at a minimum of 48 hours prior to the start of installation and stored in a clean and dry room that measures above 65°F and below 95°F and measures between 10% and 65% relative humidity (RH). To maintain temperature and relative humidity, permanent heating and air conditioning systems (HVAC) must be in operation. Place pallets of textile composite flooring modules on a flat surface (do not double stack pallets). After work is completed, the ambient room temperature should remain at 65°F and relative humidity between 10% and 65% for 48 hours. These materials and related adhesives shall be protected from the direct flow of heat from heating fixtures and appliances such as hot-air registers, radiators, or other. Site conditions shall include those specified in the flooring manufacturer's installation instructions and shall also include sufficient heat, light and power required for effective and efficient working condition.

I. Once the temperature and relative humidity in area for installation have been stabilized, loose lay the modules within the installation area and allow them to precondition for 48 hours prior to installation. Module installation shall not commence until painting and finishing work is complete and ceiling and overhead work is tested, approved and completed. Traffic shall be closed during the installation of the textile composite flooring products. Verify concrete slabs are dry per the standards for bond and moisture tests listed in the manufacturer's installation instructions

## 1.6 EXTRA MATERIALS:

A. See Section 01600 - Product Requirements, for additional requirements.

B. **Provide not less than Two (2) full cases of 12" x 24" pieces of modular carpet for storage and use by Owner as replacement for future damaged or stained carpet.** THIS IS A REQUIREMENT FOR FINAL CLOSEOUT.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS:

A. Carpet:
1. Acceptable Manufacturer: Kinetex, a brand of J+J Flooring Group, P.O. Box 1287, Dalton, GA, 30722. (800) 241-4586. JJ-KINETEX.COM. Please contact Brad Bunch , (479) 305-4004, Brad.Bunch@jjflooringgroup.com
2. NO Substitutions allowed.

## 2.2 CARPET:

A. Carpet - 12" x 24" modulars, laid in Ashlar Pattern
1. Product: Timber Demi-Plank 1825
2. Color: Buckthorn 1926
3. Backing: Polyester Felt Cushion
4. Dye Method: Solution Dyed
5. Wear Layer: Universal Fibers Polyester

6. Total Weight (Nominal Average): 4.5 oz - 5.2 oz / square foot
7. Pattern Repeat: N/A
8. Soil Release: Yes
9. Standard Size: 12" x 48"
10. Warranties: Lifetime Product Performance, Colorfastness to Light & Crocking, Stain Removal, Static Protection, Protection from Edge Ravel and Delamination Failure; Lifetime Dimensional Stability.
11. Testing Specifications - Pill Test: Yes
12. Testing Specifications - Flooring Radiant Panel: Class 1
13. Testing Specifications - Smoke Density: Less than 450 flaming (ASTM E 662)
14. Testing Specifications - Static Test: Less than 3kv (AATCC-134)
15. Recycled content: Minimum of 55% recycled content
16. NSF/ANSI 140 Platinum Certified

**2.3 ADHESIVES:**

A. Kinetex® Adhesive, an aggressive, pressure-sensitive adhesive designed for the installation of Kinetex textile composite flooring modules is required.

B. Kinetex PreFix®, a quick installation for all Kinetex textile composite flooring products. The release liner easily peels away to reveal a series of pre-applied adhesive strips that securely anchor the Kinetex module in place, (PreFix Primer is required).

**2.4 ACCESSORIES:**

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Kinetex requires protective transition 3/16-inch to other floor covering thickness. Provide transition/reducing strips tapered to meet abutting materials as indicated in the drawings.

C. Provide aluminum edge with lip to protect Kinetex edge.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify that sub-floor surfaces as smooth and flat with maximum variation of 1/8 inch to 10 ft.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of adhesives to sub-floor surfaces.

C. Verify that concrete sub-floor surfaces are ready for carpet installation by testing for moisture emission rate and alkanlinity; obtain instructions if test results are not within limits recommended by carpet manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

**3.2 PREPARATION:**

A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

C. Clean substrate.

## 3.3 INSTALLATION - GENERAL:

A. Install carpet in accordance with manufacturer's instructions and CRI 104. Carpet is to be installed using the "Monolithic" method.

B. Verify carpet match before cutting to ensure minimal variation between dye lots.

C. Lay-out carpet per manufacturer's recommendations
   1. Provide monolithic color, pattern and texture match within any one area.

D. Install carpet tight and flat on sub-floor, well fastened at edges, with uniform appearance.

## 3.4 DIRECT-GLUED CARPET (Releasable):

A. Make cuts straight, true, non-gapping and un-frayed.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

## 3.5 CLEANING:

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

**END OF SECTION**

# SECTION 09800
# SPECIAL CLEAR PROTECTIVE TREATMENT

## PART 1 - GENERAL

### 1.01 GENERAL:

A. General requirements of the Project Manual shall apply to all work specified in this section.

B. Related Sections:
   1. Section 03354 – Polished Concrete: Materials and work included in this section shall be coordinated with all work related to polished concrete.

### 1.02 QUALITY ASSURANCE:

A. Installer shall be proficient in concrete floor diamond polishing and protective coating system installations.
   1. Installer shall be trained & certified by Adsil, or its' appointed agents, using Specification #AD1130-01 procedure established in accordance with Adsil methods and standards for clear concrete floor system protective coatings.
   2. Installer shall ensure that all technicians utilized for work in this section are -
      a. trained and certified journeymen in the Adsil MicroGuard® Inorganic Clear Concrete Protective Coating System.
      b. shall have demonstrated a proficiency in the use of concrete grinding and polishing techniques.
   3. Installer shall ensure that any specialized equipment, as required by the manufacturer, will be used for work in this section.

### 1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information, including Product Technical Data Sheets, Material Safety Data Sheets, detailing job site and personal safety instructions, product mixing instructions and installation instructions for each material specified. Identify by manufacturer's catalog number and general classification.
   1. Technical Data Sheet TS-54; MicroKleen™ Phosphoric Acid Etch & Clean PLC-35
   2. Technical Data Sheet TS-45; MicroKleen™ Industrial Cleaner & Degreaser PLC-1
   3. Technical Data Sheet TS-43; MicroKleen™ Retarder Solvent AD1-103
   4. Technical Data Sheet TS-44; MicroKleen™ Spray & Equipment Cleaner AD1-919
   5. Technical Data Sheet TS-34; MicroGuard® Concrete Clear Sealer AD702
   6. Technical Data Sheet TS-22; MicroGuard® Concrete Clear Gloss Treatment AD703
   7. Technical Data Sheet; Lithium Silicate Densifier

B. Third Party Data: Submit any relevant test studies, relative to floor treatment systems, when using MicroGuard® Inorganic Clear Concrete Protective Coating Systems on new or in use concrete floor surfaces.

### 1.04 DELIVERY AND STORAGE:

A. Deliver materials in sealed containers with manufacturer's labels intact.

B. Store materials in a protected area at a temperature range between $55^0$ and $85^0$ F.

**1.05 JOB CONDITIONS:**

A. Install MicroGuard® protective treatments only under the following prevailing conditions:
1. Air, surface and material temperatures are not below $55^0$ F. or above $95^0$ F.
2. Prevent wide temperature variations, which might result in condensation forming on the freshly treated surfaces or could affect hydrolyzing or curing.
3. Avoid all water contact, of any sort, on freshly treated surfaces for a minimum of 12 hours following installation.

B. Mask or protective surfaces not to receive protective treatment.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS:**

A. Products of Adsil, Inc., Daytona Beach, Florida, USA. (Phone: 386-274-1382)

**2.02 MATERIALS:**

A. Cleaners, Conditioners & Solvents
1. Adsil MicroKleen™ PLC-35 Phosphoric Acid Etch & Clean
2. Adsil MicroKleen™ PLC-1 Industrial Cleaner & Degreaser
3. Adsil MicroKleen™ AD1-103 Retarder Solvent
4. Adsil MicroKleen™ AD1-919 Spray & Equipment Cleaner

B. Protective Concrete Floor Surface Treatments
1. Adsil MicroGuard® AD702 Concrete Clear Sealer
2. Adsil MicroGuard® AD703 Concrete Clear Gloss Treatment

**2.03 PRODUCT REQUIREMENTS:**

A. Surface Cleaners & Conditioners
1. Cleaners shall be free from any known carcinogen or teratogen materials.
2. Cleaners shall be phosphorous free.
3. Cleaners shall be d'limonene free.

B. Surface Rinses
1. Rinses shall be free from any known teratogens, mutagens, sensitizers or reproductive toxins.

C. Concrete Protective Surface Coatings
1. Surface Coatings shall be ambient temperature cured inorganic film structures.
2. Surface Coatings shall adhere to substrate by London Force Bonding methods.
3. Surface Coatings shall produce a dry film thickness no greater than 12 microns, on average, per coat (1 mil = 25.4 microns).
4. Surface Treatments shall have passed ASTM G-21, with a zero (0) microbial spore growth development rating*.
5. Surface Treatments shall not lose more than 25 mg of film, when tested according to ASTM D 4060 Taber Abrasion; using the CS-17 wheel*.
*Standard ASTM testing must have been conducted and validated by an accredited, third party, independent laboratory.

**2.04 MATERIAL PREPARATION:**

A. Catalyze and/or mix materials strictly in accordance to manufacturer's most current published technical literature.

B. Thinning of material, upon specific need, should only be accomplished using MicroKleen™ Retarder Solvent AD1-103 for the MicroGuard® Clear Sealers and Treatments.

**PART 3 - EXECUTION**

**3.01 PRE-WORK INSPECTION:**

A. Examine the concrete floor to be treated and report any conditions that would adversely affect the general appearance or performance of the protective treatment system and which cannot be repaired or put into an acceptable condition by repair or specified surface preparation methods.

B. Do not proceed with the mixing or installation of the specified protective treatments until the concrete floor can be placed into an acceptable condition.

**3.02 EQUIPMENT REQUIREMENTS:**

A. Spray Equipment (for spray or spray & back roll application method)
1. Air compressor, which can deliver 3 CFM of air @ 90 PSI (minimum).
2. Adsil Dual Regulated Stainless Steel Pressure Pot or
3. MYTEE Big Boss Sprayer #6001 (modified)
4. Adsil Spray Gun/Wand with $45^0$ connector
5. Adsil #5 & #10 cone tips (4 sets of each)
6. Adsil Chemical Resistant Hose with quick connect couplers
7. Adsil Product Mixer with Timer

B. Clean, white or clear HDPE plastic buckets (5 gallon size).

C. T-bar and quality synthetic, mohair or lamb's wool pads.

D. Assorted tools, extension cords, water hose & nozzle, squeegee, buckets, rags, etc;

E. 175 RPM Swing Machine.

F. Full assortment of diamond grinding and polishing pads; from 50 steel to 800 resin.

G. Assortment of black/green pads, clean-grit nylon brushes & 200 grit sanding screens.

H. High Pressure Extraction Equipment.

I. Tarps, drops, plastic sheathing and masking tape.

J. Safety Equipment - Respiratory NIOSH Black Cartridge, eye goggles, latex gloves, first aid kit, eye wash station; Adsil Product MSDS & Technical Sheets.

**3.03 SURFACE PREPARATION:**

A. General
1. Prior to all surface preparation and installation operations, mask, remove or protect all fixtures and adjacent surfaces from preparation and treatment procedures.
2. Place drop cloths, tarps, plastic sheathing or other protection over any fixtures,

baseboards, wall surface areas that should be protected from the preparation, cleaning and protective treatment installation.

B. Specific Grinding & Cleaning
   1. The bare concrete surface must have aged for 28 days.
   2. Uniformly wet the surface with clean tap water. Begin with an initial wet grinding to achieve a 200 grit surface profile and remove residue with extraction equipment.
   3. Clean all contamination from the surface with Adsil MicroKleen™ Industrial Cleaner & Degreaser PLC-1. Pre-dilute the PLC-1 Cleaner, 1 part cleaner to 1 part clean, hot water. Flood the surface and allow the PLC-1 Cleaner to soak for approximately 5 minutes, but do not allow the cleaning solution to dry. If drying in an area occurs, lightly refresh that area with more PLC-1 Cleaner or a very light spray of tap water to keep the PLC-1 Cleaner functioning in a moist environment.
   4. After 5 minutes, work area using a 175 RPM Swing Machine with a nylo-grit brush. Pick up residue with extraction equipment. Continue the cleaning process, as specified above, until the surface is clean and free from contaminates.
   5. In some jurisdictions, the use and collection of cleaning materials may be regulated. It is the responsibility of the Installer to be aware of any such regulations and to take appropriate steps to collect and dispose of cleaning materials, in accordance with any such regulations.
      a. In these instances, the Installer must control the cleaning material waste stream.
      b. To provide means of containment of material and collection of material for proper disposal, according to regulations. Rinse and reclaim extraction equipment should be used and then rinsate should be placed in drums for material collection, neutralizing and disposal.

C. Specific Densifier & Polishing
   1. Allow surface to dry completely before Densifier installation.
   2. Apply lithium silicate Densifier by low pressure spray after the initial grinding and cleaning procedures. Follow manufacturer's instructions implicitly.
   3. Begin polishing the treated concrete to the final finish profile of 800 grit using progressively finer polishing disks.
   4. Remove all slurry residues between diamond changes using extraction equipment.

D. Specific Final Drying
   1. Allow the surface to air dry completely. The use of fans or de-humidifiers can be used to accelerate drying.
   2. Full drying of the surface must occur prior to the installation of MicroGuard® Inorganic Clear Sealers & Treatments. Use a standard probe moisture meter to establish the moisture content of the concrete. A reading of 20% moisture content or less must be achieved before product installation proceeds.

## 3.04 MIXING AND CATALYZING SEALER:

A. MicroGuard® Concrete Clear Surface Sealer AD702
   1. MicroGuard® AD702 is a three-component material and must be properly mixed for curing to occur. This product is packaged, in kit form, with separate containers for Components A, B & C.
   2. Refer to Technical Sheet TS-34 for Adsil published mixing instructions.
      a. Following the induction period, but prior to installation, add up to 20% Retarder Solvent AD1-103 into the properly mixed AD702. Stir until the solvent is uniformly dispersed.

### 3.05 INSTALLATION - MicroGuard® Concrete Clear Sealer AD702:

A. Strictly follow Adsil's recommendations and instructions regarding product material and mixing, so as to provide the best quality work.

B. All materials shall be applied under adequate illumination, evenly distributed and properly applied.

C. All materials shall be applied in an even and full continuous film, free from skips, holidays or pinholes.

D. MicroGuard® Concrete Clear Sealer AD702 can be applied by two preferred methods; installation by spray or spray and back padding with a T-bar.
   1. Conventional Spray Installation - Use an air compressor that can deliver a minimum of 3 CFM @ 90 PSI.
   2. Use an Adsil dual regulated pressure pot.
   3. Or a MYTEE Big Boss Diaphragm Sprayer modified by Adsil.
   4. Spray the AD702 Sealer using the special wand/gun housing a #10 cone tip seated into the $45^0$ wand/connector. Always spray in a thin and uniform film deposit. Configure your spray installation so that a working wet line is maintained. Work to natural breaks whenever possible.
   5. If desired, back pad the spray installed sealer with a T-bar and pad.
   6. MicroGuard® Sealer AD702 will yield between 600 to 650 $ft^2$ per gallon.
   7. Allow the MicroGuard® Concrete Clear Sealer AD702 to air dry for a minimum of 4 hours before finish coating.

### 3.06 MIXING AND CATALYZING FINISHING TREATMENT:

A. MicroGuard® Concrete Clear Gloss Treatment AD703
   1. MicroGuard® AD703 is also a three-component material and must be properly mixed for curing to occur. This product is packaged, in kit form, with separate containers for Components A, B & C.
   2. Refer to Technical Sheet TS-22 for Adsil published mixing instructions.
      a. Following the induction period, but prior to installation, add up to 20% Retarder Solvent AD1-103 into the properly mixed AD703. Stir until the solvent is uniformly dispersed.

### 3.07 INSTALLATION - MicroGuard® Concrete Clear Gloss Treatment AD703:

A. Strictly follow Adsil's recommendations and instructions regarding product material and mixing, so as to provide the best quality work.

B. All materials shall be applied under adequate illumination, evenly distributed and properly applied.

C. Materials shall be applied in an even & full continuous film, free from skips, holidays or pinholes.

D. MicroGuard® AD703 is best applied by prescribed spray methods onto the previously installed MicroGuard® Clear Concrete Sealer AD702. Back padding with T-bar is also acceptable.
   1. Use an air compressor that can deliver a minimum of 3 CFM @ 90 PSI.
   2. Use an Adsil dual regulated pressure pot.
   3. Or a MYTEE Big Boss Diaphragm Sprayer modified by Adsil.

4. Spray AD703 using the special wand/gun housing a #10 cone tip seated into the $45^0$ wand/connector. Always spray in a thin and uniform film deposit. Maintain a working wet line. Work to natural breaks whenever possible.
5. If desired, back pad the spray installed sealer with a T-bar and pad.
6. MicroGuard® Sealer AD703 will yield between 650 to 700 $ft^2$ per gallon.

E. Dry/Cure Times - MicroGuard® AD703 will dry to touch in about 2 hours. Allow at least 8 to 12 hours cure time before opening the coated surface to light foot traffic and at least 24 hours before forklift traffic. MicroGuard® AD703 will reach full cure and durability after 5 days, depending on ambient temperature and relative humidity.

**3.08 CLEAN UP:**

A. Any drips, spills or over spray, of the Protective Treatments, can be cleaned using a cotton cloth saturated with MicroKleen™ Spray & Equipment Cleaner AD1-919. Remove drips, spills or over spray before the Protective Treatment dries to touch.

B. Remove any masking and other debris from job site and leave storage area clean.

**3.09 INSPECTION:**

A. Inspect and/or repair all work that is not acceptable to the Specifier and request the final acceptance.

**3.10 PROTECTIVE SURFACE COATING SCHEDULE:**

A. As indicated on schedules
   1. Concrete Flooring
      a. Apply one coat of MicroGuard® Concrete Clear Sealer AD702 onto cleaned and properly polished concrete surfaces.
      b. Apply one coat of MicroGuard® Concrete Clear Gloss Treatment AD703 onto the AD702 Sealer.

B. The following areas are to receive Microguard AD702 and AD703 over polished concrete surfaces:
- Offices 167, 189, 190, 191
- Construction Carpentry Lab 168
- Construction Storage 170
- Criminal Justice Lab 171
- Storage 177, 188
- Welding Lab 187
- Dressing 192, 198
- Corridor 194
- Women 193 and Men 197
- Welding Classrooms 201, 202
- Aviation 231 and Tool Storage 232
- Compressed Air 233
- Storage 234, 235, 236
- Composite Lab 237 and Non-Destructive Test Lab 238
- Aviation Classroom 239

**END OF SECTION**

# SECTION 09835
# TEXTURED MULTICOLOR & METALLIC WALL FINISHES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Textured Multicolor and Metallic coatings.
   1. Rich eggshell base with textured pattern coat (Armor)
   2. Rich eggshell base with sparkling metallic top coat (Burnished Metallic)

### 1.2 SUMMARY:

A. Scope: Provide labor, material, equipment, related services and supervision required, including but not limited to, manufacturing, fabrication, erection and application for multicolor/high performance wall finishes as required for the complete performance of the work, and as shown on the drawings and as herein specified.
   1. Paint shall contain anti-microbial to inhibit the growth of mold, mildew, and bacterial from setting up on the dried paint film.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:
   1. Surface preparation.
   2. Water-based polyurethane/acrylic textured paint finish system.

C. Related Sections: Section 09260 - Gypsum Board Assemblies: Preparation of Substrates.

### 1.3 REFERENCES:

A. ASTM C 1308 "Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes:"

B. ASTM D 2486, "Standard Test Method for Scrub Resistance of Interior Latex Flat Wall Paints."

C. ASTM D 2794, "Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)."

D. ASTM E 84, "Standard Test Method for Surface Burning Characteristics of Building Materials."

E. ASTM G 53, "Standard Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for exposure of Non-Metallic Materials."

F. Painting and Decorating Contractors of America (PDCA): PDCA P5, "Benchmark Sample Procedures for Paint and Other Decorative Coating Systems."

G. South Coast Air Quality Management District (SCA QMD): SCAQMD Rule #1168, "Adhesive and Sealant Applications," including most recent amendments.

### 1.4 SYSTEM DESCRIPTION:

A. Performance:
   1. VOC: Coatings shall have less than 110 g/l of VOC's
   2. Fire Rating: Coatings shall be Type 1 or Class A fire-rated, ASTM E 84
   3. Scrub Test: Greater than 25,000 cycles, ASTM D 2486
   4. Impact Resistance: Greater than 160 in/lbs, ASTM D 2794

5. Chemical Resistance: 10 (test maximum) for all chemicals tested, ASTM D 1308
6. QUV Accelerated Weathering: Greater than 95 percent gloss retention after 500 hours, ASTM G53
7. Stain Removal: 8 to 10 (test maximum) for all stains tested, four-hour Open Spot Test

## 1.5 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics: sizes, patterns, colors available and method of installation/application.
1. Submit written proof of approval by the manufacturer and written acknowledgment that equipment to be used is approved by finish system manufacturer.

C. Quality Control Submittals: Submit letter from manufacturer stating that applicator has completed manufacturers training program.

D. Finish Samples:
1. Sample Card: Submit two sample cards indicating manufacturer's standard selection of finish colors.
2. Samples: submit two 4 x 5 inches samples of cardboard with specified or selected finishe colors.
3. Control samples: Submit two samples of each finish color to ensure ability to reproduce selected finishes.

## 1.6 QUALITY ASSURANCE:

A. Qualifications:
1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of decorative finishes of types and sizes required, and whose products have been satisfactory use in similar services for minimum of five years
   a. Manufacturer to certify they make all materials in this Section.
   b. All materials within special coatings section including, but not limited to, finishes and primers shall be supplied by one manufacturer.
2. Applicator Qualifications: Applicator shall be a firm that shall have a minimum of three years of successful applications experience with projects utilizing decorative finishes similar in type and scope to that required for this Project and shall be approved by the manufacturer.
   a. Applicator shall certify in writing that technicians utilized for work in this Section have been trained by the manufacturer or its representative.
   b. Applicator shall include in his certification that specialized equipment as required by the manufacturer shall be used for work in this Section.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations for Federal, State and local authorities having jurisdiction. Obtain necessary approvals from authorities.

C. Mock-ups: Prior to application of the work, fabricate and erect mock-ups for each type of finish and application required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work.
1. Provide mock-ups under provisions of Section 01400.
2. Prepare a mock up as per PDCA P5
3. Apply 100 s.f. of finish system at location on the Project as directed by Architect. Provide separate mock-up for each finish color.

4. If accepted, mock-up shall demonstrate minimum standard for the work. Mock-up may remain as part of work.

D. Pre-Application Conference: Conduct pre-application conference. Prior to commencing the application, meet at the Project site to review the material selections, application procedures, and coordination with other trades. Mock-ups shall be reviewed during the pre-application conference. Pre-application conference shall include, but shall not be limited to, the Contractor, the Applicator, manufacturer's representatives, and any trade that requires coordination with the work. Date and time of the pre-application conference shall be acceptable to the Owner and the Architect.

## 1.7 DELIVERY, STORAGE, AND PROTECTION:

A. Comply with Section 01400 - Quality Requirements.

B. Deliver materials in their original, unopened containers bearing manufacturer's labels.

C. Provide fire extinguisher in storage area. Do not leave open containers. Remove empty cans and rags with oil or solvent from building every day.

D. Store between 50 and 80 degrees F.

E. Protect materials from freezing.

## 1.8 PROJECT CONDITIONS:

A. Apply coating under the following conditions:
1. Temperature of air and substrate is between 50 and 80 degrees F.
2. Relative humidity shall be less than 50 percent.
3. Prevent wide temperature fluctuations that could cause moisture condensation on freshly coated surfaces.
4. Substrate is dry to touch.
5. Application areas shall be free of excessive dust.

B. Lighting: Maintain 80 foot candles minimum on surface to be finished.

C. Provide adequate fresh air and ventilation during application.

## 1.9 WARRANTY:

A. General: See Section 01780 - Close-Out Procedures.

B. Special Warranty: The manufacturer shall warrant the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials for a period of five years from date of Substantial Completion. This special warranty shall extend the one year period of limitations contained in the General Conditions.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## 1.10 MAINTENANCE MATERIALS:

A. See Section 01600 - Product Requirements, for additional provisions.

B. Extra Stock: Provide one gallon of each base color used and one gallon of each pattern boat color used. Provide in sealed, labeled containers.

C. See manufacturer's website for touch-up requirements and instructions. Provide a copy for the Owner in the close-out manual.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Master Coating Technologies "Scuffmaster". Contact manufacturer's representative: ARK-LA-TEX Wall Source, Inc. Shreveport, LA. 1-800-730-3061.
1. Armor
   a. Color: See Spec Section 00860 - Interior Color Schedule.
2. Burnished Metallic Armor
   a. Color: See Spec Section 00860 - Interior Color Schedule.

B. Substitutions: See Section 01600 - Product Requirements:
1. Submit proposed substitution to Architect not less than 10 days before bid date. Acceptance will be by Addendum.
2. Submit color blend samples, product data, installation instructions and test reports. Clearly indicate discrepancies between specified product and proposed substitution.
3. The Architect will be the sole judge of the basis of what is equivalent.

### 2.2 MATERIALS:

A. Primer: Provide primer recommended by manufacturer for substrate.
1. New Gypsum Board: "Primemaster Primer/Sealer," Master Coating Technologies.
2. Primed Metals: No primer required.
3. Unprimed Metals: In accordance with the manufacturer's recommendations.

B. Textured/Multicolor Finish System Components (New Gypsum Board/Sheetrock):
1. Base Coat:
   a. 1 coat - "Scuffmaster" PC200", Master Coating Technologies.
2. Pattern Coat:
   a. "Scuffmaster AC1200", Master Coating Technologies.
3. Miscellaneous Materials: Surface patching compounds and to other materials necessary for application of finish system shall be of high quality and compatible with coating system.

C. Metallic Finish System Components (New Gypsum Board/Sheetrock):
1. Base Coat:
   a. 1-2 coats - "Scuffmaster" Burnished Metallic, Master Coating Technologies.
2. Top Coat:
   a. "Scuffmaster Burnished Metallic Top Coat", Master Coating Technologies.
3. Miscellaneous Materials: Surface patching compounds and to other materials necessary for application of finish system shall be of high quality and compatible with coating system.

### 2.3 EQUIPMENT:

A. Spray or roll primers and base coats in accordance with manufacturer's instructions.

B. Spray pattern coats using manufacturer's proprietary spray equipment only. Contact local manufacturer representative or contact the manufacturer before bidding this work.

C. See Application Instructions included with this section.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Examine areas and conditions under which the work is to be applied and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
   1. Verify that substrates are ready to receive work of this Section and are in accordance with coating manufacturer's requirements. Report any conditions that would adversely affect the appearance or performance of the coating systems.
   2. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Applicator.

**3.2 PREPARATION:**

A. Protection: Mask adjacent surfaces to prevent over-spray. Protect floors and other surfaces with drop cloths.
   1. Remove items which are not to be coated from surfaces that are to be coated. Tag and protect removed items and store until re-installation. Re-install items after completion of coating application. Items which are not be coated include, but shall not be limited to, operating hardware, electrical device plates, and factory-finished items.
   2. Patch and repair substrates as specified in applicable specifications sections. Clean substrates. Remove dirt, grit, loose materials, grease, oil, temporary protective coatings, contamination, other foreign materials, etc. Sand with 100 grit or finer sand paper, spackle, putty, and caulk existing surfaces to product smooth and uniform substrates. Spot-prime existing water-soluble stains with alcohol or oil-based stain killing primer. Touch-up painted or primed surfaces with compatible paint or specified primer.

B. Remove items which are not be coated from surfaces which are to be coated. Tag and protect removed items and store until reinstallation. Reinstall items after completion of coating application. Items which are not to be coated include: operating hardware, electrical device plates, and factory finished items.

C. Gypsum Board: Apply joint tape and compound to joints, fastener heads, dents, and surface flaws as specified in Section 09260 - Gypsum Board Assemblies. Sand smooth and flush with adjacent surfaces. Thoroughly clean sanded areas of dust with a clean damp rag.

**3.3 APPLICATION:**

A. Applicator shall apply coating in accordance with manufacturer's written instructions and using manufacturer-approved equipment.
   1. Finish HVAC registers and grilles located in surfaces to receive coatings.

B. Basecoat: Apply as many coats as necessary to produce a uniform substrate appearance. Do not exceed manufacturer's recommended coverage rate. Allow to dry prior to application of subsequent coats.

C. Re-prime suction and hot spots on substrate prior to applying base coating.

D. Sand: Over wood and gypsum board, sand basecoat with 100 grit or finer sandpaper. Thoroughly remove dust from sanding with a clean, wet rag.

E. Multicolor Finish: Apply in two steps:
   1. Spray or roll base to completely cover primer and according to manufacturer's written instructions. Apply in a continuous even film at manufacturer's specified coverage rate.
   2. Spray pattern coat using manufacturer's proprietary spray equipment. Adjust spray top size and air pressure for specified finish according to manufacturer's written instructions. Apply pattern coat uniformly to match approved finish standard and at manufacturer-specified coverage rates. Slight variations in particle size, shape, and density shall be normal for textured coatings.

F. Apply each coat to a natural break point such as an edge or corner without stopping.

G. Finishes shall match approved benchmark samples and shall be free of runs, sags, holidays and excessive irregularity/unevenness of pattern coat. Transitions between colors and/or other materials shall be sharp, clean and without overlaps.

**3.4 INSPECTION:**

A. Request acceptance of each coat before applying succeeding coats.

B. Touch-up and repair unacceptable work.

C. Protect finished areas form damage.

**3.5 CLEANING:**

A. Cleaning up oversprays and spills. Remove masking before coating has completely cured.

B. Repair damage to coatings and surfaces caused by clean-up activities.

C. Allow product to cure for at least seven days following application before applying cleaning chemicals.

D. Most stains can be removed using warm water and detergent. More difficult stains may require stronger cleaners and a light abrasive pad. Before using a new cleaner for the first time, test its effect on the finish by apply in an inconspicuous area as a small amount of paint may also be removed during the cleaning process.

E. For difficult stains such as black permanent marker, spray-paint, ink, mustard, ketchup, grease and lipstick, use non-toxic Graffitimaster stain remover from Master Coating Technologies.

**3.6 PROTECTION:**

A. Provide final protection and maintain conditions in a manner acceptable to the Applicator, that shall ensure that the high performance coatings shall be without damage at time of Substantial Completion.

**END OF SECTION**

# SECTION 09900
# PAINTING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES:

A. Interior and exterior painting, including surface preparation.

### 1.2 RELATED SECTIONS:

A. Section 05100 - Structural Steel.

B. Section 05310 - Steel Roof Deck.

C. Section 05500 - Metal Fabrications.

D. Section 05521 - Mezzanine Guard Rails and Gates.

E. Section 06200 - Finish Carpentry.

F. Section 07600 - Flashing and Sheet Metal.

G. Section 08111 - Standard Steel Doors.

H. Section 08112 - Standard Steel Frames.

I. Section 008211 - Flush Wood Doors.

J. Section 08341 - Vertical "Lift Strap" Bi-Fold Hanger Door.

K. Section 009260 - Gypsum Board Assemblies.

L. Section 09835 - Textured Multi-Color and Metallic Wall Finishes.

### 1.3 REFERENCES:

A. Green Seal Standard GS-11; May 20, 1993.

B. US Green Building Council, (USGBC) - Green Seal standards for LEED paint credits.

C. Occupational Safety and Health Act (OSHA) - Safety Standards.

D. American National Standards Institute (ANSI) - Performance Standards.

E. Paint Decorating Contractors of America (PDCA) - Application Standard.

F. National Paint and Coatings Association (NPCA) - Gloss Standard.

G. American Society for Testing Materials (ASTM) - Testing Methods.

H. Master Paint Institute (MPI # ) - Established paint categories and standards.

I. Ozone Transmission Commission (OTC) - Established levels of Volatile Organic Compounds.

J. SCAQMD 1168 - South Coast Air Quality Management District Rule #1168; October 3, 2003.

K. SSPC (PM1) - Steel Structures Painting Manual, Vol. 1, Good Painting Practice; Society for Protective Coatings; 1993, Third Edition.

L. SSPC (PM2) - Steel Structures Painting Manual, Vol. 2, Systems and Specifications; Society for Protective Coatings; 1995, Seventh Edition.

M. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

### 1.4 DEFINITIONS:

A. Commercial as used in this Section refers to a product well suited for a commercial application.

B. DFT as used in this Section refers to the Dry Film Thickness of the coating.

C. Enamel refers to any acrylic or alkyd (oil) base paint which dries leaving an eggshell, pearl, satin, semi-gloss or high gloss enamel finish.

D. DTM as used in this Section refers to paint that is applied Direct To Metal.

E. LEED as used in this Section refers to Leadership in Energy and Environmental Design. Products listed meet LEED criteria for environmentally safe interior primers, paints and coatings.

F. OTC as used in this Section refers to the Ozone Transmission Commission. OTC has established the following VOC levels for the Northeastern United States. Products shall meet the following OTC limits for VOC's.
1. Interior flat paints: 100 grams per liter or less, per gallon.
2. Interior enamels: 150 grams per liter or less, per gallon.
3. Interior stains: 250 grams per liter or less, per gallon.
4. Interior primers: 200 grams per liter or less, per gallon.
5. Rust preventive coatings: 400 grams per liter or less, per gallon.
6. Dry fog coatings: 400 grams per liter or less, per gallon.
7. Floor coatings: 250 grams per liter or less, per gallon.

G. Premium as used in this Section refers to the best quality product "top of the line".

H. VOC as used in this Section refers to Volatile Organic Compounds found in primers, paints, sealers and stains. The level of VOCs appears after each product listed in the Schedule in grams per liter (g/L).

I. Paints are available in a wide range of sheens or glosses, as measured by a gloss meter from a 60 and/or 85 degree angle from vertical, as a percentage of the amount of light that is reflected. The following terms are used to describe the gloss of our products. The list below is provided for general guidance; refer to the technical data sheet for the actual gloss/sheen level for each product.
1. Flat - Less than 5 Percent.
2. Eggshell - 5 - 20 Percent.
3. Satin - 20 - 35 Percent.
4. Semi-Gloss - 30 - 65 Percent.
5. Gloss - Over 65 Percent.

**1.5 SUBMITTALS:**

A. Submit under and coordinate with provisions of Section 01300 - Submittals.

B. Product Data: Provide a complete list of all products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category.
2. Cross-reference to specified paint system(s) that the product is to be used in; include description of each system.

C. Samples: Submit three paper samples, 5 inches by 7 inches (127mm x 178mm) in size, illustrating selected colors for each color and system selected with specified coats cascaded.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

**1.6 QUALITY ASSURANCE:**

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten years experience.

B. Installer Qualifications: All products listed in this section are to be applied by a Painting Contractor with a minimum of five years demonstrated experience in surface preparation and field application of the same type and scope as specified.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Mock-up areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Approved mock-up areas will serve as the standard for remaining Work.

4. Refinish mock-up area as required to produce acceptable Work.

## 1.7 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.

C. Disposal:
1. Never pour leftover coating down any sink or drain. Use up material on the job or seal can and store safely for future use.
2. Do not incinerate closed containers.
3. For specific disposal or recycle guidelines, contact the local waste management agency or district. Recycle whenever possible.

## 1.8 PROJECT CONDITIONS:

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

## 1.9 WARRANTY:

A. Inspection of all surfaces to be coated must be done by the manufacturer's representative to insure proper preparation prior to application. All thinners, fillers, primers and finish coatings shall be from the same manufacturer to support a product warranty. Products other than those submitted shall be accompanied by a letter stating its fitness for use and compatibility.

B. At project closeout, provide to the Owner or owner's representative an executed copy of the Manufacturer's standard form outlining the terms and conditions of and any exclusions to their Limited Warranty against Manufacturing Defect.

## 1.10 EXTRA MATERIALS:

A. At project closeout, supply the Owner or owner's representative one gallon of each product for touch-up purposes. Cans shall be clearly marked with color name, number and type of paint.

B. At project closeout, provide the color mixture name and code to the Owner or owner's representative for accurate future color matching.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS:

A. Acceptable Manufacturer: Benjamin Moore and Co., which is located at: 101 Paragon Dr ; Montvale, NJ 07645; Toll Free Tel: 866-708-9181; Email: info@benjaminmoore.com; Web: www.benjaminmoore.com

B. Substitutions: as approved by Architect

C. Requests for substitutions will be considered in accordance with provisions of Section 01600 - Product Requirements.

## 2.2 MATERIALS - GENERAL:

A. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D-National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

B. Compatibility: Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

## 2.3 MIXING AND TINTING:

A. Except where specifically noted in this section, all paint shall be ready-mixed and pre-tinted. Agitate all paint prior to and during application to ensure uniform color, gloss, and consistency.

B. Thinner addition shall not exceed manufacturer's printed recommendations. Do not use kerosene or other organic solvents to thin water-based paints.

C. Where paint is to be sprayed, thin according to manufacturer's current guidelines.

## 2.4 INTERIOR PAINT SYSTEMS:

A. METAL: Aluminum, Galvanized.
   1. Alkyd System:
      a. Gloss Finish Waterborne Alkyd:
         1) 1st Coat: Benjamin Moore Super Spec HP Acrylic Metal Primer P04 (47 g/L).
         2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L.
         3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd High Gloss N794 (48 g/L).

B. METAL: Galvanized; Ceilings, Duct work.
   1. Multi-Surface Acrylic Coating System:
      a. Gloss Finish High Performance:
         1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L).
         2) 2nd Coat: Corotech Acrylic DTM Enamel Gloss V330 (199 g/L).

C. METAL - (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal)
   1. Alkyd System:
      a. Semi-Gloss Finish Waterborne Alkyd:
         1) 1st Coat: Benjamin Moore Super Spec HP Acrylic Metal Primer P04 (47 g/L).
         2) 2nd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L).
         3) 3rd Coat: Benjamin Moore Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L).

D. WOOD - (Walls, Ceilings, Doors, Trim):
   1. Latex Systems:
      a. Semi - Gloss Finish:
         1) 1st Coat: Benjamin Moore Fresh Start Multi-Purpose Primer N023 (44 g/L).
         2) 2nd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L).
         3) 3rd Coat: Coronado Rust Scat Waterborne Acrylic Semi-Gloss 90 (134 g/L).
   2. Stain and Varnish System:
      a. Gloss Finish:
         1) 1st Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300 (240 g/L).
         2) 2nd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L).
         3) 3rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L).
   3. Varnish System:
      a. Gloss Finish:
         1) 1st Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L).
         2) 2rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L).

E. DRYWALL - (Walls, Ceilings, Gypsum Board and similar items)
   1. Latex Systems:
      a. Eggshell / Satin System:
         1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L.
         2) 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L).
         3) 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L).

## 2.5 EXTERIOR PAINT SYSTEMS:

A. METAL: Aluminum, Galvanized.
   1. Latex Systems:
      a. Semi-Gloss Finish:
         1) 1st Coat: Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (45 g/L).
         2) 2nd Coat: Benjamin Moore Ultra Spec HP Acrylic DTM Semi-Gloss Enamel HP29 (45 g/L).

B. METAL: Misc. Iron, Ornamental Iron, Structural Iron and Steel, Ferrous Metal.
   1. Latex Systems:
      a. Semi-Gloss Finish
         1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L).
         2) 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L).
         3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L).

## PART 3 EXECUTION

### 3.1 EXAMINATION:

A. The Contractor shall review the product manufacturer's special instructions for surface preparation, application, temperature, re-coat times, and product limitations.

B. The Contractor shall review product health and safety precautions listed by the manufacturer.

C. The Contractor shall be responsible for enforcing on site health and safety requirements associated with the Work.

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

E. Ensure that surfaces to receive paint are dry immediately prior to application.

F. Ensure that moisture-retaining substrates to receive paint have moisture content within tolerances allowed by coating manufacturer. Where exceeding the following values, promptly notify Architect and obtain direction before beginning work.
   1. Concrete and Masonry: 3-5 percent. Allow new concrete to cure a minimum of 28 days.
   2. Exterior Wood: 17 percent.
   3. Interior Wood: 15 percent.
   4. Interior Finish Detail Woodwork, Including Trim, and Casework: 10 percent.
   5. Plaster and Gypsum: 15 percent.
   6. Concrete Slab-On-Grade: Perform calcium chloride test over 24 hour period or other acceptable test to manufacturer. Verify acceptable moisture transmission and pH levels.

G. Examine surfaces to receive coatings for surface imperfections and contaminants that could impair performance or appearance of coatings, including but not limited to, loose primer, rust, scale, oil, grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions.

H. Correct conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

### 3.2 PREPARATION - GENERAL:

A. Clean surfaces thoroughly prior to coating application.

B. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.

C. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; cover stains and marks which cannot be completely removed with isolating primer or sealer recommended by coating manufacturer to prevent bleed-through.

D. Remove Mildew, Algae, and Fungus using materials and methods recommended by coating manufacturer.

E. Remove dust and loose particulate matter from surfaces to receive coatings immediately prior to coating application.

F. Remove or protect adjacent hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items not indicated to receive coatings.

G. Move or protect equipment and fixtures adjacent to surfaces indicated to receive coatings to allow application of coatings.

H. Protect adjacent surfaces not indicated to receive coatings.

I. Prepare surfaces in accordance with manufacturer's instructions for specified coatings and indicated materials, using only methods and materials recommended by coating manufacturer.

**3.3 SURFACE PREPARATION :**

A. Gypsum Board: Repair cracks, holes and other surface defects with joint compound to produce surface flush with adjacent surfaces.

B. Masonry Surfaces - Restored: Remove loose particles, sand, efflorescence, laitance, cleaning compounds and other substances that could impair coating performance or appearance.

C. Metals - Aluminum, Mill-Finish: Clean and etch surfaces with a phosphoric acid-water solution or water based industrial cleaner. Flush with clean water and allow to dry, before applying primer coat.

D. Metals - Ferrous, Unprimed: Remove rust or scale, if present, by wire brush cleaning, power tool cleaning, or sandblast cleaning; remove grease, oil, and other contaminants which could impair coating performance or appearance by solvent cleaning, with phosphoric-acid solution cleaning of welds, bolts and nuts; spot-prime repaired welds with specified primer.

E. Metals - Ferrous, Shop-Primed: Remove loose primer and rust, if present, by scraping and sanding, feathering edges of cleaned areas to produce uniform flat surface; solvent-clean surfaces and spot-prime bare metal with specified primer, feathering edges to produce uniform flat surface.

F. Metals - Galvanized Steel (not passivated): Clean with a water-based industrial strength cleaner, apply an adhesion promoter followed by a clean water rinse. Alternately, wipe down surfaces using clean, lint-free cloths saturated with xylene or lacquer thinner; followed by wiping the surface dry using clean, lint-free cloths.

G. Metals - Galvanized Steel, Passivated: Clean with water-based industrial strength cleaner. After the surface has been prepared, apply recommended primer to a small area. Allow primer to cure for 7 days, and test adhesion using the "cross-hatch adhesion tape test" method in accordance with ASTM D 3359. If the adhesion of the primer is positive, proceed with a recommended coating system for galvanized metal.

H. Metals - Stainless Steel: Clean surfaces with pressurized steam, pressurized water, or water-based industrial cleaner.

I. Wood:
1. Seal knots, pitch streaks, and sap areas with sealer recommended by coating manufacturer; fill nail recesses and cracks with filler recommended by coating manufacturer; sand surfaces smooth.
2. Remove mill marks and ink stamped grade marks.
3. Apply primer coat to back of wood trim and paneling.

J. Wood Doors: Seal door tops and bottoms prior to finishing.

K. Wood Doors - Field-Glazed Frames and Sash: Prime or seal glazing channels prior to glazing.

**3.4 APPLICATION - GENERAL:**

A. Application of primers, paints, stains or coatings, by the Contractor, will serve as acceptance that surfaces were properly prepared in accordance with the manufacturer's recommendation.

B. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.

C. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.

D. Inspect each coat before applying next coat; touch-up surface imperfections with coating material, feathering, and sanding if required; touch-up areas to achieve flat, uniform surface without surface defects visible from 5 feet (1.5 m).

E. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

F. Where paint application abuts other materials or other coating color, terminate coating with a clean sharp termination line without coating overlap.

G. Where color changes occur between adjoining spaces, through framed openings that are of same color as adjoining surfaces, change color at outside stop corner nearest to face of closed door.

H. Re-prepare and re-coat unsatisfactory finishes; refinish entire area to corners or other natural terminations.

**3.5 CLEANING:**

A. Clean excess coating materials, and coating materials deposited on surfaces not indicated to receive coatings, as construction activities of this section progress; do not allow to dry.

B. Re-install hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items that have been removed to protect from contact with coatings.

C. Reconnect equipment adjacent to surfaces indicated to receive coatings.

D. Relocate to original position equipment and fixtures that have been moved to allow application of coatings.

E. Remove protective materials.

**3.6 PROTECTION AND REPAIR:**

A. Protect completed coating applications from damage by subsequent construction activities.

B. Repair to Architect's acceptance coatings damaged by subsequent construction activities. Where repairs cannot be made to Architect's acceptance, re-apply finish coating to nearest adjacent change of surface plane, in both horizontal and vertical directions.

END OF SECTION

# SECTION 10100
# VISUAL DISPLAY BOARDS

## PART 1- GENERAL

### 1.1 SECTION INCLUDES:

A. Markerboards

B. Lecture Cabinets.

### 1.2 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide manufacturer's data on markerboard, trim and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint locations, special anchor details.

D. Manufacturer's printed installation instructions.

E. Maintenance Data: Include data on regular cleaning, stain removal, and surface repair.

### 1.3 QUALITY ASSURANCE:

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### 1.4 WARRANTY:

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing, or cracking, and staining.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Visual Display Boards:
   1. Claridge Products and Equipment, Inc., Harrison, Arkansas 72601, Phone: 1-800-434-4610, www.claridgeproducts.com.

B. Substitutions: Under provisions of Section 01600 - Product Requirements.

### 2.2 VISUAL DISPLAY BOARDS:

A. Markerboards: Porcelain enamel on steel, laminated to core.
   1. Color: White.
   2. Metal Face Sheet Thickness: 0.024 inch (24 gage).
   3. Core: Particleboard, manufacturer's standard thickness, laminated to face sheet.
   4. Backing: Aluminum foil, laminated to core.
   5. Size: As indicated on drawings.
   6. Frame: Extruded aluminum, with concealed fasteners.
   7. Frame Finish: Anodized, natural.

8. Accessories: Provide chalk tray and map rail.

B. Lecture Cabinets:
1. Style: Contemporary
2. Size: 4' x 4'. Cabinets are 3-3/4" deep.
3. Fixed Back Panel: LCS-II Porcelain Enamel steel markerboard with No. 75 Low Gloss finish for use with dry erase markers and for projection.
4. Doors: Outside - hardwood to match frames; Inside - Designer Fabric bulletin board, color 1691 Quartz.
5. Hanging Devices: Concealed -bar hangers for easy and secure installation.
6. Accessories:
   a. Built-in marker tray
   b. Display Rail with cork insert and spring clip hooks inside both doors.
   c. Four assorted LCS dry-erase markers and one LCS eraser
   d. Sketching pad - 20" x 22" (50 sheets)
7. Color: #516-4 modified with Ebony finish.

## 2.3 MATERIALS - MARKERBOARDS:

A. Porcelain Enameled Steel Sheet: ASTM A 424, Type I, commercial quality, with fired-on vitreous finish.

B. Particleboard: ANSI A208.1; wood chips, set iwth waterproof resin binder, sanded faces.

C. Foil Backing: Aluminum foil sheet, 0.0005 inch thick.

## 2.4 ACCESSORIES - MARKERBOARDS:

A. Map Rail: Extruded aluminum, manufacturer's standard profile, with cork inset and runners for accessories; 1 inch wide overall, full width of frame.

B. Chalk Tray: Aluminum, manufacturer's standard profile one piece full length of markerboard, modeled ends; concealed fasteners, same finish as frame.

C. Mounting Brackets: Concealed.

# PART 3 - EXECUTION

## 3.1 EXAMINATION:

A. Verify that field measurements are as indicated.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

## 3.2 INSTALLATION:

A. Install boards in accordance with manufacturer's instructions.

B. Secure units level and plumb.

C. Butt Joints: Install with tight hairline joints.

D. Provide blocking as required for secure mounting.

**3.3 CLEANING:**

A. Clean board surfaces in accordance with manufacturer's instructions.

**3.4 SCHEDULE:**

A. Refer to the Drawings for sizes and locations.

**END OF SECTION**

# SECTION 10171
# SOLID PLASTIC TOILET COMPARTMENTS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Solid high density polymer plastic toilet compartments.

B. Solid high density polymer plastic urinal screens.

### 1.2 RELATED SECTIONS:

A. Section 06114 - Wood Blocking and Curbing.

B. Section 10800 - Toilet Accessories.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Show layout of partitions, screens and compartments.

C. Product Data: Manufacturer's catalog data on panels, pilasters, doors, hardware and fastening.

D. Color Charts: Manufacturer's complete range of colors.

E. Samples:
   1. Actual panel material, not less than 6 inches square.
   2. Actual hardware.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER:

A. Manufacturer's:
   1. General Partitions Mfg. Corp, Erie, Pennsylvania
   2. Scranton Products, Scranton, Pennsylvania

B. Substitutions: See Section 01600 - Product Requirements.

### 2.2 COMPARTMENTS AND SCREENS:

A. Toilet Compartments: Solid polymer plastic.
   1. Floor-mounted, overhead braced.

B. Urinal Screens: Solid polymer plastic.
   1. Wall hung.

### 2.3 SOLID POLYMER MATERIALS:

A. Panels: High density polyethylene, nominal 1 inch thick by 55 inches high, with uniform color throughout and uniformly machined radius edges.
   1. Color: As specified in Section 00860 - Color Placement Schedule.

B. Doors: Same design and construction as specified panels; nominal 1 inch thick by 55 inches high.

C. Pilasters: Same design and construction as specified for panels and doors; nominal 1 inch thick.

D. Urinal Screens: Same design and construction as specified for panels; nominal 1 inch thick.
1. Height: 42 inches.
2. Depth: 18 inches.

E. Urinal Screen Anchors:
1. To Wall: One full length double ear bracket, fastened with 8 wall fasteners.

**2.4 HARDWARE:**

A. Hardware: Provide all hardware an fasteners for a complete installation.
1. Aluminum wrap around hinge assembly
2. Surface mounted aluminum slide latch
3. Coat hook
4. Aluminum door stop and keeper
5. Fittings - panels anchored to pilasters with a continuous U-bracket.
6. Pilaster trim to be 3" high.
7. All hardware and fittings to be secured with vandal-proof sex bolts of proper length.

B. NO THRU BOLTS WILL BE ALLOWED.

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

A. Install partitions rigid, straight, plumb and level in accordance with manufacturer's instructions.

B. Set units with not more than ½ inch between pilasters and panels and not more than 3/4 inch between panels and walls.

C. Floor-Mounted: Secure to structural concrete floor.

D. Wall-Mounted: Provide sufficient structural blocking for secure, stable mounting.

E. Adjust and lubricate hardware for proper operation after installation.
1. Set hinges on in-swing doors to hold doors in the open or closed position when unlatched as shown on drawings.
2. Set hinges on out-swing doors to return to the fully closed position.
3. Remove protective plastic coating.

**END OF SECTION**

# SECTION 10350
# FLAGPOLES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Aluminum flagpoles.

B. Flags to be provided by Owner.

### 1.2 REFERENCES:

A. Aluminum Association (AA): Aluminum Finishes.

B. American society for Testing and Materials (ASTM):
   1. ASTM B 241 - Standard Specification for Aluminum and Aluminum - Alloy Seamless Pipe and Seamless Extruded Tube.
   2. ASTM B 597 - Standard practice for Heat Treatment of Aluminum Alloys.

C. National Association of Architectural metal Manufacturers (NAAMM): NAAMM FP 1001 - Guide Specifications for Design of Metal Flagpoles.

### 1.3 SUBMITTALS:

A. General: Submit listed submittals in accordance with Contract Conditions and Section 01300 - Submittal Procedures.

B. 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 instructions.

C. Shop Drawings: Indicate information on shop drawings as follows:
   1. Include details of foundation system.

### 1.4 QUALITY ASSURANCE:

A. Source:
   1. Obtain each flagpole as a complete unit from approved manufacturers, including fittings, accessories, bases, and anchorage devices.

### 1.5 DELIVERY, STORAGE & HANDLING:

A. Spiral wrap flagpoles with heavy paper and enclosed in a hard fiber tube or other protective container.

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

C. Keep flagpole and accessories covered and dry to prevent soiling or damage.

D. Handle with protective gloves to prevent unwanted distortion.

### 1.6 PROJECT CONDITIONS:

A. Structural Performance: Provide flagpole assemblies, including anchorages nd supports, capable of

withstanding the effects of wind loads, determined according to NAAMM FP 1001 for specified ground speed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Acceptable Manufacturers subject to compliance with requirements:
1. American Flagople & Flag Co.; lake Elmo, MN 55042. ASD. Toll Free Tel: (800) 426-6235. Fax: (651) 777-1925. Email: info@aflag.com www.aflag.com
2. American Flagpole
3. Flag and Banner, Little Rock, Arkansas

B. Fabricate from seamless, extruded tubing complying with ASTM B 221, alloy 6063-T6, having a tensile strength not less than 30,000 psi with yield point of 25000 psi. Heat treated after fabrication to comply with ASTM B 597, temper.

C. Ground set, cone-tapered, aluminum flagpole. Including ground sleeve, external halyard system, ball-bearing nonfouling, revolving truck assembly, rope, ball to match flagpole base diameter, cleat and two nylon snap hooks. Finish all exposed metal surfaces to match flagpole.

1. One (1) pole at:
   a. Exposed Height: 25 feet
   b. Overall Length: 28 feet
   c. Diameter: 4" base and 2" top
   d. Wall Thickness: .125"
   e. Wind Speed: 50 MPH flagged, 97 MPH un-flagged
   f. Mounting Device: PVC Ground Sleeve
2. Two (2) poles at:
   a. Exposed Height: 20 feet
   b. Overall Length: 23 feet
   c. Diameter: 3" base and 2" top
   d. Wall Thickness: .125"
   e. Wind Speed: 50 MPH flagged, 97 MPH un-flagged
   f. Mounting Device: PVC Ground Sleeve
3. Six (6) poles at:
   a. Exposed Height: 15 feet
   b. Overall Length: 18 feet
   c. Diameter: 3" base and 2" top
   d. Wall Thickness: .125"
   e. Wind Speed: 50 MPH flagged, 97 MPH un-flagged
   f. Mounting Device: PVC Ground Sleeve

D. Finish:
1. Directional Sanded Satin Finish: Fine, directional, medium satin polish; buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.
   a. Satin Brushed Aluminum finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Do not begin installation until final grades and elevations have been established.

B. If others determine final base elevation, confirm with Architect before proceeding.

### 3.2 INSTALLATION:

A. Install flagpoles where shown on drawings and in accordance with manufacturer's written instructions. Verify final location with Architect prior to installing.

B. Flagpole shall be plumbed with ½" for every 10 feet of pole height.

**END OF SECTION**

# SECTION 10500
# SOLID PLASTIC LOCKERS & ALUMINUM BENCHES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Fully assembled solid high density polymer plastic lockers.

B. Solid high density polymer benches.

C. Furnish all labor and materials necessary for the completion of work in this section as shown on the drawings and specified herein.

### 1.2 RELATED SECTIONS:

A. Section 06114 - Wood Blocking and Curbing.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Show layout of lockers and benches.

C. Product Data: Manufacturer's catalog data.

D. Color Charts: Manufacturer's complete range of colors.

E. Samples:
1. Actual panel material, not less than 6 inches square.
2. Actual hardware.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER:

A. Manufacturer's - Lockers:
1. General Partitions Mfg. Corp, Erie, Pennsylvania
2. Scranton Products, Scranton, Pennsylvania

B. Manufacturer - Benches:
1. The Athletic Edge, 1-800-743-7738,

C. Substitutions: See Section 01600 - Product Requirements.

### 2.2 MATERIALS:

A. Sides, shelves, tops, and bottoms shall be made from 3/8" thick polymer with homogeneous color.
1. Double Tier, 15" deep x 12" wide x 72" height
2. Color: As specified in Section 00860 - Color Placement Schedule.

B. Doors: Same design and construction as specified above; ½" thick.

### 2.3 FABRICATION:

A. Fabricate locker components square and rigid, with finish free from scratches and chips.

B. Lockers shall ship fully assembled, requiring only attachment of interior accessory items.

C. Separate solid plastic components will be secured using perimeter dado routing to provide a continuous and solid joint that slides together for assembly.

D. Locker sides and backs shall form a one-piece unit constructed from a single and contiguous sheet of solid plastic requiring no hardware. Door frames shall be bonded to locker bodies using plastic welding process.

E. Continuous spring-loaded latch mechanism shall provide a vertical finger lift that is capable of accepting a padlock and is securely fastened to the door. Latch mechanism shall be attached to the length of the door, providing a continuous security latch.

F. Door Hinge shall be continuous and integrate into the full length of the door and main locker body, with no metallic knuckles or pins.

G. Ventilation - Pattern of 6 horizontal slots in upper and lower ranges of door.

H. Coat hooks shall be made from steel, zinc plated to resist corrosion and attached to intermediate shelves at the locker.

I. Sides using hardware supplied by the manufacturer. Provide two per opening on the 12" wide, double tier openings.

J. Finish shall be slightly textured for tops, bottoms, shelves and sidewalls to reduce marring in the color natural white. Doors to have a slightly textured finish to reduce marring and will be selected from the manufacturer's standard colors.

K. All lockers with doors 12" or higher shall be a vertical lift handle that required no pinching, twisting, grasping or lateral motion to disengage.

L. All lockers with doors shall include a padlock attachment.

**2.4 BENCHES:**

A. Locker benches with anodized aluminum top and powder coated aluminum pedestals legs. Benches shall be 18" high x 10" deep, secured to bench tops with stainless steel tamper resistant torx head screws and secured to the floor using lead expansion shields with 2" stainless steel phillips head machine bolts. Bench length required are: 1 - 6'-0" and 1 - 8'0". Benches will come standard with 3 leg design. Color of powder coated aluminum legs to match anodized aluminum top color.

**2.5 ACCESSORIES:**

A. Number Plates: Provide each locker with a polished aluminum number plate, 2-1/4" wide by 1" high, with black numerals not less than 3/8" high; attach to face of door with two aluminum rivets.

B. Continuous recessed locker base shall be constructed of 3" x 3/4" HDPE providing a 3" high and deep toe-kick.

C. Finished end panels shall be constructed of one piece of ½" thick HDPE and attached using concealed tamper resistant fasteners.

D. Finished flat top panel shall be constructed of one piece of ½" thick HDPE and attached using concealed tamper resistant fasteners.

E. Continuous Sloping hood shall be constructed of ½" thick HDPE and attached using concealed tamper resistant fasteners.

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

A. Install lockers and benches rigid, straight, plumb and level in accordance with manufacturer's instructions.

B. Wall-Mounted: Provide sufficient structural blocking for secure, stable mounting.

C. Examine areas to receive lock room benches for correct location and spacing of anchorage/blocking that may affect installation of benches. Report any discrepancies to the Architect.

D. No evidence of cutting, drilling, and/or patching shall be visible on the finished work.

E. Finished surfaces shall be cleaned after installation and be left free of all imperfections.

**END OF SECTION**

# SECTION 10523
# FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Fire Extinguishers.

B. Fire Extinguisher Cabinets.

C. Surface mounting hardware.

### 1.2 REFERENCES:

A. NFPA 10 - Standard for Portable Fire Extinguishers; National Fire Protection Association; 1998.

B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories, Inc.; current edition.

### 1.3 PERFORMANCE REQUIREMENTS:

A. Conform to NFPA 10.

B. Provide extinguishers classified and labeled by Underwriters Laboratories, Inc. For the purpose specified and indicated.

### 1.4 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate cabinet physical dimensions.

C. Product Data: Provide extinguisher operational features.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

### 1.5 ENVIRONMENTAL REQUIREMENTS:

1.6

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Manufactuer's:
   1. Larsen's Manufacturing Co.
   2. J.L. Industries.
   3. Modern Metal Products.

4. Substitutions: See Section 01600 - Product Requirements.

**2.2 FIRE EXTINGUISHERS:**

A. Dry Chemical Type: Cast steel tank, with pressure gauge.
1. Class A: B: C:
2. Size 10.
3. Finish: Baked enamel, red color.

**2.3 FIRE EXTINGUISHER CABINETS:**

A. Metal: Formed stainless steel sheet; 0.036 inch thick base metal.

B. Cabinet Configuration: Semi-recessed type.
1. Model: Larsen's Model SS-C2409-R, clear bubble-red letters, use manufacturer's recommended bracket.
2. Sized to accommodate accessories.
3. Exterior nominal dimensions of 13 inch wide x 27.5 inch high including trim x 4 inch deep.
4. Trim: Flat, 5/16 inch wide face.
5. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

C. Door: 0.036 inch thick, reinforced for flatness and rigidity; latch. Hinge doors for 180 degree opening with two butt hinge. Provide nylon catch.

D. Door Glazing: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing.

E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.

F. Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: #4.

H. Finish of Cabinet Interior: White enamel.

**2.4 SURFACE MOUNTING HARDWARE:**

A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

**3.2 INSTALLATION:**

A. Install at approximate locations indicated on drawings. Verify final locations of extinguishers with Architect prior to rough in for cabinets. Coordinate location with Architectural, Mechanical, Plumbing and/or Electrical items.

B. Install in accordance with manufacturer's instructions.

C. Install cabinets plumb and level in wall openings, 48 inches above finished floor maximum to handle of extinguisher.

D. Secure rigidly in place.

E. Place extinguishers and accessories in cabinets.

F. Install cabinets and surface mounted extinguishers to meet ADA guidelines.

**END OF SECTION**

# SECTION 10651
# OPERABLE WALL PANLELS

## PART 1 - GENERAL

### 1.1 DESCRIPTION:

A. Furnish and install operable partitions and suspension system. Provide all labor, materials, tools, equipment and services for operable walls in accordance with provisions of contract documents.

### 1.2 RELATED WORK BY OTHERS:

A. Preparation of opening will be by General Contractor. Any deviation of site conditions contrary to approved shop drawings must be called to the attention of the Architect.

B. All header, blocking, support structures, jambs, track enclosures, surrounding insulation and sound baffles as required in 1.04 - Quality Assurance.

C. Pre-punching of support structures in accordance with approved shop drawings.

D. Paint or otherwise finishing all trim and other materials adjoining head and jamb of operable partitions.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Complete shop drawings are to be provided prior to fabrication indicating construction and installation details.

### 1.4 QUALITY ASSURANCE:

A. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.

B. The partitions STC (Sound Transmission Classification) shall be achieved per the stnadard test methods ASTM E90.

C. Noise isolation classifications shall be achieved per the standard test methods ASTM E336 and ASTM E413.

D. Noise Reduction Coefficient (NRC) ratings shall be per ASTM C423.

E. Rack testing for 10 years (tensional strength stress test).

F. The manufacturer shall have a quality system that is registered to the ISO 9001 standards.

### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Proper storage of partitions before installation and continued protection during and after installation will be the responsibility of the General Contractor.

### 1.6 WARRANTY:

A. Partition system shall be guaranteed for a period of two years against defects in materials and

workmanship, excluding abuse.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Manufactuer's:
   1. Hufcor, Inc
   2. Substitutions: See Section 01600 - Product Requirements.

### 2.2 MATERIALS:

A. Product to be top supported Series 632 paired panels as manufactured by Hufcor, Inc.
   1. Panels shall be nominally 3" thick, to 48" wide and hinged in pairs.
   2. Panel faces shall be laminated to appropriate substrate to meet the STC requirement in 2.04 - Acoustical Performance.
      a. Steel
   3. Frames shall be of 16 gauge painted steel. Face finish shall wrap around the vertical panel edges and provide no protective vertical face trim.
   4. Vertical sound seals shall be of tongue and groove configuration, ensure panel-to-panel alignment and prevent sound leaks between panels.
   5. Horizontal top seals shall be retractable, provide 1" nominal operating clearance and exert upward force when extended. All panels, including lever closure panels must have retractable top and bottom seals.
   6. Horizontal trim shall be of aluminum.
   7. Low profile hinges on basic panels shall be of steel and project no more than 1/4" beyond panel faces. Each pair of panels to have a minimum of three (3) hinges.

B. Weight of the panels shall be 5.7 - 10.2 lbs per sq ft. based on options selected.

C. Suspension System:
   1. Track shall be of clear anodized architectural grade extruded aluminum alloy 6063-T6. Track design shall provide precise alignment at the trolley running surfaces and provide integral support for adjoining, ceiling, soffit, or plenum sound barrier. Track shall be connected to the structural support by pairs of minimum 3/8" dia. threaded steel hanger rods. Guide rails and/or track sweep seals shall not be required.
      a. Each panel shall be supported by one 4-wheeled carrier. Wheels to be of hardened steel ball bearings encased with molded polymer tires.
   2. Plenum closure (by others): Design of plenum closure must permit lifting out of header panels to adjust track height. Plenum closure required for optimum sound control of partition.

D. Finishes:
   1. Face Finish shall be:
      a. Standard upgrade fabrics: Stratus - color to be selected.
   2. Exposed metal trim and seal color shall be:
      a. Gray (standard)

### 2.3 OPERATION:

A. Panels shall be manually moved from the storage area, positioned in the opening, and seals set.

B. Retractable Horizontal Seals:
   1. Shall be activated by a removable quick set operating handle located approx. 42" from the

floor in the panel edge.

2. All retractable seals in each hinged pair shall be operated simultaneously.
3. Seal activation required approx. 15 lbs of force per panel and approx. a 190 degree turn of the removable handle

C. Final partition closure to be by:
1. Lever closure panel with expanding jamb which compensated for minor wall irregularities and provides a minimum 250 lbs scale force against the adjacent wall for optimum sound control. The jamb activator shall be located approximately 45" from the floor in the panel face and be accessed from either side of the panel. The jamb is equipped with a mechanical rack and pinion gear drive mechanism and shall extend 4'-6" by turning the removable operating handle.

D. Stack/Store Panels:
1. Retract seals and move to storage area. Panels may be stored at either or both ends of the track or in a pocket.
2. Refer to Architect's drawings for proposed location(s) of storage area.

## 2.4 ACOUSTICAL PERFORMANCE:

A. Acoustical performance shall be tested at a laboratory accredited by the US Department of Commerce, National Institute of Standards and Technology, under the National Voluntary Laboratory Accreditation Program (NVLAP) in accordance with ASTM E90 Test Standards. Standard panel construction shall have obtained an STC rating of 51.
1. Complete, unaltered written test report is to be made available upon request.

# PART 3 - EXECUTION

## 3.1 INSTALLATION:

A. The complete installation of the operable wall system shall be done by an authorized factory-trained installer and be in strict accordance with the approved shop drawings and manufacturer's standard printed specifications, instructions, and recommendations.

## 3.2 CLEANING:

A. All track and panel surfaces shall be wiped clean and free of handprints, grease and soil..

B. Cartoning and other installation debris shall be removed to onsite waste collection area provided by others.

## 3.3 TRAINING:

A. Installer shall demonstrate proper operation and maintenance procedures to Owner's representative.

B. Operating handle and Owner's manual shall be provided to Owner's representative.

C. Provide 1 extra (2) total operating handles.

**END OF SECTION**

# SECTION 10800
# TOILET ACCESSORIES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Accessories for toilet rooms and utility rooms.

B. Grab bars.

### 1.2 REFERENCES:

A. ASTM A 123/A 123 M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1997a.

B. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 1995.

### 1.3 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

### 1.4 COORDINATION:

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER:

A. Bobrick .
   1. Other Acceptable Manufacturers:
      a. Bradley Corp.
      b. Parker.
      c. Substitutions: See Section 01600 - Product Requirements.

B. All items of each type to be made by the same manufacturer.

### 2.2 MATERIALS:

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with

anchors and fittings, steel anchor plates, adapters, and anchors components for installation.

1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide keys for each accessory to Owner; master key all lockable accessories.

**2.3 FINISHES:**

A. Chrome/Nickel Plating: ASTM B 456, SC 2, satin finish.

B. Galvanized for items other than Sheet: ASTM A 123A/A 123M to 1.3 oz/sq. yd. Galvanize ferrous metal and fastening devices.

**2.4 UTILITY ROOM ACCESSORIES:**

A. Mop and Broom Holder: Refer to drawings for list of utility room accessories.

**2.5 TOILET ROOM ACCESSORIES:**

A. Refer to drawings for list of toilet accessories.

**PART 3 - EXECUTION**

**3.1 EXAMINATION:**

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

**3.2 PREPARATION:**

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

**3.3 INSTALLATION:**

A. Install accessories in accordance with manufacturer's instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings.

**3.4 SCHEDULE:**

A. Refer to the schedule shown on the drawings.

**END OF SECTION**

# SECTION 11132
# PROJECTION SCREENS

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES:

A. Recessed ceiling mounted electric projection screen at lay-in ceilings.

B. Suspend ceiling mounted electric project screen at OTS ceilings.

C. Associated hardware.

### 1.2 SUBMITTALS:

A. See Section 01300 - Submittals, for submittal procedures.

B. Shop Drawings: Indicate model numbers, layout, dimensions, etc.

C. Manufacturer's Installation Instructions.

### 1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

### 1.4 DELIVERY, STORAGE AND PROTECTION:

A. Comply with Section 01400.

B. Deliver materials in their original, unopened containers bearing manufacturer's labels.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Da-Lite Screen Company, Inc.; 3100 North Detroit Street, P. O. Box 137, Warsaw, IN 46581; Phone: 1-800-622-3737.

B. Substitutions: Submit to Architect for approval.

### 2.2 MATERIALS:

A. Models:
1. At Lay-in Ceilings: Tensioned Advantage Deluxe Electrol; HDTV Format; electrically operated 120V, 1.4 amp.
2. At OTS Ceilings: Tensioned Cosmopolitan Electrol; HDTV 16:9 Format; electrically operated 120V, 1.4 amp.
3. See Schedule below for Rooms and sizes.

B. Shall have specially designed motor mounted inside the roller with a patented noise silencer to be three-wire quick reversal type, oiled for life, with automatic thermal overload cut-out, integral gears, capacitor and an electric brake to prevent coasting. To have preset but adjustable limit switches to automatically stop picture surface in the up and down positions.

C. Rollers: to be of rigid metal, 3 inches in diameter, mounted on two vibration- and noise-absorbing supports.

D. Screen Fabric: to be seamless, flame-retardant and mildew-resistant vinyl with Da-Mat picture surface with black masked borders standard. Each side of the fabric to have tab guide cable system to maintain even lateral tension and hold surface flat. Bottom of fabric shall be formed into a pocket holding a 3/8 inch metal rod. The ends of the rod shall be protected by heavy-duty plastic caps.

E. Screen to have added extra black drop as required in each room to place bottom of image at 4 feet above finished floor. Contractor must determined the amount of extra black drop needed for each screen based on finished ceiling height or mounting height a.f.f. where screens are located.

F. Case, door and trim to be finished by manufacturer - Color: White.

G. Single motor low voltage control system - 3 button built-in with screen (Built in LVC will add 10" to overall length of case).

H. Install 3 conductor 22AWG wire from low voltage control compartment to wall location and install included switch.

I. Provide "aircraft cable", "uni-strut", threaded rods, and other miscellaneous hardware for to support screen from structure above.

J. Provide silent motor at screen size 65" x 116".

## PART 3 - EXECUTION

### 3.1 EXAMINATION:

A. Verify existing conditions before starting work.

### 3.2 INSTALLATION:

A. Install in accordance with manufacturer's instructions.

B. Verify mounting heights with Architect prior to installation
1. Bottom of projection screen cases in Room 212 is to be 12'-6" a.f.f.
2. Bottom of projection screen case in all other OTS rooms is 10'-0" a.f.f.

### 3.3 SCHEDULE:

A. Schedule of Room #, Image Size and Da-Lite Model/Options and ceiling type as follows, see drawings for location:

| | | | | |
|---|---|---|---|---|
| 1. | Room 132 | 52" x 92 | TADE-L-C | Lay-In |
| 2. | Room 135 | 52" x 92 | TADE-L-C | Lay-In |
| 3. | Room 139 | 52" x 92 | TADE-L-C | Lay-In |
| 4. | Room 166 | 52" x 92 | TADE-L-C | Lay-In |
| 5. | Room 201 | 52" x 92 | TADE-L-C | Lay-In |
| 6. | Room 202 | 52" x 92 | TADE-L-C | Lay-In |
| 7. | Room 203 | 52" x 92 | TADE-L-C | Lay-In |
| 8. | Room 207 | 52" x 92 | TADE-L-C | Lay-In |
| 9. | Room 226 | 52" x 92 | TADE-L-C | Lay-In |
| 10. | Room 239 | 52" x 92 | TADE-L-C | Lay-In |

| | | | | |
|---|---|---|---|---|
| 11. | Room 214 | 65" x 116 | TADE-L-C-S | Lay-In |
| 12. | Room 215 | 65" x 116 | TADE-L-C-S | Lay-In |
| 13. | Room 133 | 52" x 92 | TCE-L-C | OTS |
| 14. | Room 137 | 52" x 92 | TCE-L-C | OTS |
| 15. | Room 138 | 52" x 92 | TCE-L-C | OTS |
| 16. | Room 140 | 52" x 92 | TCE-L-C | OTS |
| 17. | Room 141 | 52" x 92 | TCE-L-C | OTS |
| 18. | Room 171 | 52" x 92 | TCE-L-C | OTS |
| 19. | Room 238 | 52" x 92 | TCE-L-C | OTS |
| 20. | Room 212 | 65" x 116 | TCE-L-C-S | OTS |
| 21. | Room 212 | 65" x 116 | TCE-L-C-S | OTS |

B. Abbreviations:
1. "TADE" denotes Tensioned Advantage Deluxe Electrol
2. "TCE" denotes Tensioned Cosmopolitan Electrol
3. "L" denotes built-in low voltage control
4. "C" denotes custom screen (extra black drop).
5. "S" denotes silent motor

**END OF SECTION**

# SECTION 13121
# PRE-ENGINEERED BUILDINGS

## PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. Pre-engineered, shop-fabricated structural steel building frame with framed openings.

B. Metal wall and roof panels, gutters and downspouts and roof mounted equipment curbs.

C. Louvers.

1.2 REFERENCES:

A. AISC S 323 - Quality Criteria and Inspection Standards; American Institute of Steel Construction, Inc.; 1988, Third Edition.

B. AISC S 335 - Specification for Structural Steel Buildings - Allowable Stress Design, Plastic Design; American Institute of Steel Construction, Inc.; 1989.

C. AISC S 342L - Load and Resistance Factor Design Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 1993.

D. ASTM A 36/A 36M - Standard Specification for Structural Steel; 1996.

E. ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 1989a.

F. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 1994.

G. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 1996.

H. ASTM A 325M - Standard Specification for High-Strength Bolts for Structural Steel Joints (Metric); 1993.

I. ASTM A 490 - Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength; 1993.

J. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 1993.

K. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 1993.

L. ASTM A 529/A 529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 1994.

M. ASTM A 572/ A 572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 1994.

N. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1996.

O. ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process, General Requirements; 1996.

P. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 1995.

Q. ASTM C 991 - Standard Specification for Flexible Glass Fiber Insulation for Pre-Engineered Metal Buildings; 1992.

R. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 1996a.

S. AWS A2.4 - Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 1993.

T. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 1996.

U. MBMA (LR) - Low Rise Building Systems Manual; Metal Building Manufacturers Association; 1996, with Rev 1 (4/97).

V. SSPC - Paint 20 - Zinc-Rich Primers (Type I, "Inorganic", and Type II, "Organic"); The Society for Protective Coatings; 1991 (Part of Steel Structures Painting Manual, Vol. Two).

W. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories, Inc.; 1994.

1.3 DESIGN REQUIREMENTS:

A. Install Thermal Resistance of Roof System: R value of 6.

B. Design Loads:
1. Structural design criteria for the building structural system will be the 2012 IBC with Arkansas Amendments. Seismic Design shall be as per 2012 IBC.
2. Roof live loads are loads produced during the life of the structure by moveable objects. Wind, snow, seismic or dead loads are not live loads. Roof live loads are applied based on the Tributary Area as follows:
   a. 20 PSF (maximum reduction for frames = 4 PSF)
3. Snow Loads:
   a. Snow Load Coefficient (Ce) 1.0
   b. Importance Factor (I) 1.0
   c. Ground Snow Load (Pg) 10 PSF
4. The Snow Load (Pf) shall be used for design if it exceeds minimum live load. Rain or Snow additional load-governing codes may require an additional 5 PSF be added to the roof snow loads if the roof slope is < ½ : 12.
5. Wind speed is 115 mph as per 2012 IBC. Wind importance factor = 1.0. Wind Pressure Coefficients and the design pressures shall be applied per governing code.
6. The seismic design shall be based on:
   a. Ss = 2.718
      = 1.5 ( for calculation of Cs in base shear)
   b. S1=1.062
   c. Sds = 1.812
      = 1.0 ( for calculation of Cs in base shear)
   d. Sd1 = 1.062
   e. Seismic Occupancy Category = Group II
   f. Seismic Design Category = E
   g. Site Class = D

g. Site Class = D
h. Importance Factor, IE = 1.0

7. Dead Load is the weight of building system construction, such as roof, framing and covering members.
8. Collateral Load - Additional imposed loads required by the contract documents other than the weight of the metal building system. These added loads could include such items as mechanical, electrical and ceiling systems.
   a. UNIFORM ROOF LOADS – See plans
   b. CONCENTRATED ROOF LOADS - Loads and locations as shown on plans. (Mechanical).
9. Hanging Load - Additional imposed loads required by the contract documents other than the weight of the metal building system and collateral loads. These added loads are for future loads that may be added to the building. Only 50% of this loading should be used in the calculation of mass in determining the building seismic base shear.
   a. UNIFORM ROOF LOADS – See plans
10. Hoist Load – Trolley hoist to be added in the future that may occur anywhere along frames shown on the plans. Secondary support beams will be added in the future to span between frames.

C. Load Combinations: Load combinations used to design primary and secondary structural members shall be according to the governing code.

D. Allowable Deflections and Drift::

| | | |
|---|---|---|
| 1. | **Member:** Metal Wall Panels.<br>**Specified Maximum:** L/120. | **Deformation**: Perpendicular to grits.<br>**Loading:** Wind Load/Seismic Load |
| 2. | **Member:** Roof Purlins<br>**Specified Maximum:** L/180. | **Deformation:** Vertical Deflection<br>**Loading:** DL+LL+Collatera+Hanging |
| 3. | **Member:** Roof Purlins<br>**Specified Maximum:** L/240. | **Deformation:** Vertical Deflection<br>**Loading:** LL |
| 4. | **Member:** Roof Beams<br>**Specified Maximum:** L/240. | **Deformation:** Vertical Deflection<br>**Loading:** DL+LL+Collateral+Hanging |
| 5. | **Member:** Wall Girts, Support Mtl Panels<br>**Specified Maximum:** L/180. | **Deformation:** Lateral Deflection<br>**Loading:** Wind Load/Seismic Load |
| 6. | **Member:** Frames Drift at Eaves<br>**Specified Maximum:** H/240. | **Deformation:** Horizontal Deflection<br>**Loading:** Wind Load/Seismic |

E. Calculations for deflections shall be done using only the bare frame method. Reductions based on engineering judgment using the assumed composite stiffness of the building envelope shall not be allowed. When maximum deflections are specified, calculations shall be included in the design data. Deformation calculations for wind shall use 50-year mean recurrence allowable wind loading. Frame deformations used for seismic drift criteria is based upon the amplified deflection as determined by EQ. 12.8-15 of ASCE 7-10. All other seismic deflection criteria is based upon elastic deflections. Refer to the table in the specifications for deflection limits.

F. Provide drainage to exterior for water entering or condensation occurring within wall or roof system.

G. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 110 degrees F.

H. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

1.4 SUBMITTALS:

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Letter of Certification:
   1. Submit written certification prepared and signed by a Professional Engineer, registered to practice in the State of Arkansas verifying that the building system design and metal roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction. The certification must reference specific dead loads, live loads, snow loads, wind loads/speeds, tributary area load reductions (if applicable), concentrated loads, collateral loads, seismic loads, end use categories, governing code bodies including year, load applications and deflections. The letter of certification must be approved before shop drawings are submitted. Letter of Certification referring to the building order WILL NOT be accepted.

C. Product Data: Provide data on profiles, component dimensions, and fasteners.

D. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections, attachments, openings, cambers, loads, and all member sizes, and clearances; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation; framing anchor bolt settings, sizes and locations from datum, and foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.

E. Samples: Submit two samples of pre-coated metal panels for each color selected, 12 x 12 inch in size illustrating color and texture of finish.

F. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement, and other required information.

G. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

H. Project Record Documents: Record actual locations of concealed components and utilities.

1.5 QUALITY ASSURANCE:

A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a professional Structural Engineer experienced in design of this work and licensed in the State of Arkansas.
   1. Conform to 2012 International Building Code (IBC) and 2010 IBC for submission of design calculations and reviewed shop and erection drawings as required for acquiring permits.
   2. Cooperate with regulatory agency or authority and provide data as requested.

B. Perform work in accordance with AISC "Specification for Structural Steel Buildings - Allowable Stress Design, Plastic Design", AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings", and MBMA "Low Rise Building Systems Manual".

C. Perform welding in accordance with AWS D1.1.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience. Note: the products specified under this section as well as products specified under 07466 and 07620 shall be provided by a single supplier.

E. Erector Qualifications: Company specializing in performing the work of this section with

minimum 3 years documented experience.

1.6 PRE-INSTALLATION MEETING:

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

1.7 WARRANTY:

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Manufacturer shall warrant that finish coating shall not peel, crack, chip, check, or experience material rust through for 20 years. During this period manufacturer shall warrant that chalking shall not exceed #8 per ASTM D 4214 and fading shall be 5E Color Difference Units or less per ASTM D 2244.

D. Manufacturer shall include coverage for weather tightness of building enclosure elements after installation.

E. The manufacturer's twenty year weather tightness warranty shall be equal to "Source I" as offered by MBCI. Include the desirable panel design and warranty design in the specifications.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS:

A. Manufacturers shall meet the requirements of the International Accreditation Service, Inc. document AC472, "Accredation Criteria for Inpsection Programs for Manufacturers of Metal Building Systems." Manufactures are not required to be certified by the International Accreditation Service (IAS), but must meet the technical criteria. Upon successful bidding, the manufacture shall submit documentation depicting how it meets the requirements of the IAS. This documentation shall be submitted to the Architect/Engineer and approved prior to contracts being signed.

2.2 PRE-ENGINEERED BUILDING:

A. Single - Span Rigid Frame: High profile, center ridge, clean span, frame building. Provide columns and rafter depths as shown on Contract Documents. Side wall girts are inset. Refer to architectural drawings for other restrictions and requirements on frames and spacing. In no case shall the framing and its bracing penetrate into finish space.

B. Bay Spacing: Refer to drawings for varying spaces.

C. Wind Bracing: In Plane of the Roof Use Rods. CABLES are NOT ACCEPTABLE. Exterior Walls use Portal Frames. Locate Portal Frames in bays shown on plan. In no case shall any framing penetrate the finish space.

D. Secondary Framing: Purlins, girts, eave struts, flange bracing, sill supports, clips, and wind columns, and other items detailed. In no case shall any framing penetrate the finish space. Provide framing for Mechanical Roof and Wall Openings.

E. Wall System: Preformed metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.

F. Roof System: Preformed metal panels oriented parallel to slope, with sub-girt framing/anchorage

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

3.3 ERECTION - GUTTERS AND DOWNSPOUTS:

A. Rigidly support and secure components. Joint lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

B. Slope gutters minimum 1/4 inch/ft.

C. Install 9 x 18 inch concrete splash pads under each downspout as shown on plan.

3.4 INSTALLATION - ACCESSORIES:

A. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07900.

3.5 TOLERANCES:

A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.

B. Siding and Roofing: 1/8 inch form true position.

**END OF SECTION**

# SECTION 21 05 00
# COMMON WORK RESULTS FOR FIRE SUPPRESSION

## PART 1 GENERAL

### 1.01 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Sleeves.
   3. Escutcheons.
   4. Supports and anchorages.

### 1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

### 1.03 SUBMITTALS

A. Welding certificates.

### 1.04 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

## PART 2 PRODUCTS

### 2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.02 JOINING MATERIALS

A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

**2.03 SLEEVES**

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
1. Underdeck Clamp: Clamping ring with set screws.

**PART 3 EXECUTION**

**3.01 PIPING SYSTEMS - COMMON REQUIREMENTS**

A. Install piping per NFPA 13 and according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

K. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

L. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Section 07 84 00 - Firestopping for materials.

N. Verify final equipment locations for roughing-in.

O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

P. All piping penetrations of floors, walls, partitions, etc. shall be caulked / sealed full perimeter regardless of whether or not the partition wall is fire rated.

**3.02 PIPING JOINT CONSTRUCTION**

A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems. Comply with NFPA 13.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

**3.03 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

B. Field Welding: Comply with AWS D1.1.

**3.04 PRESSURE TEST**

A. The results of all piping system pressure tests shall be submitted to the construction manager for record purposes.

**3.05 PROTECTION OF WORK**

A. The contractor must take appropriate precautions during construction to prevent dust and debris from entering water systems by covering equipment and open-ended pipes as the installation progresses.

**END OF SECTION**

# SECTION 21 05 48

# VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 SUMMARY

A. This Section includes the following:
   1. Restraining braces.

### 1.02 DEFINITIONS

A. SBC: Standard Building Code.

B. ICC-ES: ICC-Evaluation Service.

### 1.03 SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

### 1.04 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the Standard Building Code and NFPA 13 unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall be acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

## PART 2 PRODUCTS

### 2.01 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Amber/Booth Company, Inc.
   2. Cooper B-Line, Inc.; a division of Cooper Industries.
   3. Hilti, Inc.
   4. Kinetics Noise Control.
   5. Mason Industries.

B. Channel Support System: shop or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

C. Hanger Rod Stiffener: Reinforcing steel angle clamped.

D. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

## PART 3 EXECUTION

### 3.01 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:
   1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   2. Install seismic-restraint devices using methods approved by an evaluation service, an agency acceptable to authorities having jurisdiction and providing required submittals for component.

B. Piping Restraints:
   1. Comply with requirements in MSS SP-127 and NFPA 13.
   2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
   3. Brace a change of direction longer than 12 feet.

C. Install seismic-restraint devices using methods approved by an evaluation service, an agency acceptable to authorities having jurisdiction, and providing required submittals for component.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Set anchors to manufacturer's recommended torque, using a torque wrench.
   5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

### 3.02 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 21 Section "Water-Based Fire-Suppression Systems" for piping flexible connections.

**END OF SECTION**

# SECTION 21 10 00
# WATER BASED FIRE PROTECTION SPRINKLER SYSTEM

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Design and install a wet-pipe sprinkler system for the new building as indicated on the drawings.

B. Design and install an early suppression, fast response (ESFR) wet-pipe sprinkler system for the aviation hangar as indicated on the drawings.

### 1.02 REFERENCES

A. NFPA 13 - Installation of Sprinkler Systems.

B. NFPA 14 - Installation of Standpipe and Hose Systems.

C. NFPA 20 - Installation of Stationary Pumps for Fire Protection.

D. NFPA 24 - Private Fire Service and Their Appurtenances.

E. ANSI/AWWA C110 - Ductile Iron Fittings.

F. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast.

### 1.03 SYSTEM DESCRIPTION

A. System to provide light hazard coverage for the office and administration area.

B. ESFR system shall provide coverage of aviation lab.

C. System to provide ordinary hazard, group 2 (two) coverage for storage rooms and welding lab.

D. Interface system with building control system including fire and smoke alarm system.

E. Provide sprinkler system to NFPA 13 occupancy requirements.

F. Hydraulically calculate system for density as required by NFPA 13, fire marshal, and owner's insurance underwriter.

G. Provide underground water main service compliant with requirement of NFPA 24.

H. Connect to water main as indicated on civil drawings.

I. Provide seismic restraints for sprinkler piping per NFPA 13 and SBC.

Refer to Section 21 05 48.

J. Identification of sprinkler piping.

### 1.04 QUALITY ASSURANCE

A. Design and installation to conform to NFPA 13, NFPA 14, NFPA 20, and NFPA 24.

B. Equipment and Components: Bear UL and FM label or marking.

C. Design sprinkler system under direction of Professional Engineer experienced in design of wet pipe sprinkler systems.

D. Specialist Firm: Company specializing in sprinkler systems with 5 documented years' experience.

E. Maintain one copy of each document on site.

### 1.05 REGULATORY REQUIREMENTS

A. Hydraulic Calculations, Product Data, Shop Drawings: Bear stamp of approval of authority having jurisdiction, Local and State Fire Marshal, and Owner's fire insurance underwriter.

### 1.06 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00.

B. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories.

C. Submit shop drawings, product data, and hydraulic calculations to authority having jurisdiction, Local and State Fire Marshal, and Owner's insurance underwriter for approval. Submit proof of approval to Architect/Engineer. Shop drawings must be signed by a responsible managing employee and submitted by a registered fire protection contractor.

**1.07 PROJECT RECORD DOCUMENTS**

A. Submit documents under provisions of Section 01 78 21.

**1.08 OPERATION AND MAINTENANCE DATA**

A. Submit manufacturer's operation and maintenance data under provisions of Section 01 78 21.

B. Include written maintenance data on components of system, servicing requirements, and record drawings.

**1.09 DELIVERY, STORAGE, AND HANDLING**

A. Deliver, store, protect, and handle products to site under provisions of Section 01 10 00.

B. Deliver and store valves in shipping containers, with labeling in place.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

**1.10 EXTRA STOCK**

A. Provide extra sprinkler heads under provisions of NFPA 13 and Section 01 77 70.

B. Provide suitable wrenches for each head type.

C. Provide metal storage cabinet in sprinkler riser room.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

**PART 2 PRODUCTS**

**2.01 PIPING MATERIALS**

A. Above Ground Inside Building Piping: Steel, as permitted by NFPA 13.

B. Under Ground Outside Building: Ductile iron 200 psi with mechanical joints as allowed by NFPA 24.

C. Branch Piping Above Grade: Steel pipe and fittings as permitted by NFPA 14.

**2.02 FIRE PROTECTION FITTINGS**

A. Welded, threaded, or grooved-end type fittings shall be used on sprinklers and sprinkler riser nipples.

B. Rubber-gasketed grooved-end pipe and fittings with mechanical couplings shall be permitted on pipes 40.0 mm in diameter and larger. Fittings, mechanical couplings, and rubber gaskets shall be supplied by the same manufacturer in accordance with the manufacturer's written instructions.

C. Fittings shall be one of the following:
1. Malleable iron, banded-type or cast ferritic ductile iron with threaded ends.
2. Cut grooved with malleable iron or ductile iron fittings.
3. Standard seamless steel with butt-welded ends.
4. Forged steel with flanged ends.

D. Underground joint shall be AWWA C111 mechanical joint with restraint fitting / retainer gland or approve neoprene gasketed restraint push on joint. All bolts, nuts and accessories shall be AWWA compuant grade and type, COR-blue bolts and nuts.

**2.03 PIPING SPECIALTIES**

A. Sprinkler alarm valve.

B. Water motor alarm.

C. Flow detector switches.

D. Tamper switches for valves.

**2.04 SPRINKLER HEADS FOR WET PIPE SYSTEMS**

A. Semi-recessed, pendent type sprinkler heads at lay-in ceiling grid.

B. Exposed Area Type: Standard upright, with brass finish.

C. Storage Type: ESFR K=16.8 equal to Tyco ESFR-17.

D. Sprinkler heads shall be quick response type.

**2.05 PIPE MARKERS**

A. Color: Conform to ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification or fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon type, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

**PART 3 EXECUTION**

**3.01 INSTALLATION - PIPE**

A. Install piping in accordance with NFPA 13 for sprinkler systems and NFPA 24 for underground systems.

B. Do not penetrate building structure members unless indicated.

C. Provide sleeves when penetrating floors and walls.

D. Seal pipe and sleeve penetration to achieve fire resistance equivalent to fire separation required.

E. Contractor shall provide seismic restraints for sprinkler piping per NFPA 13 and SBC. Provide flexible couplings at flexure points per NFPA 13 and maintain clearances around piping penetrations through walls and partitions per NPFA 13.

F. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

G. Install piping to allow for expansion and contraction without stressing pipe or joints.

H. Provide concrete thrust blocks and restraints as required by NFPA 24.

I. Connect to existing underground fire protection piping fed from local municipality. Pay all fees incurred for tapping of existing water main.

**3.02 INSTALLATION - VALVES**

A. Install valves with stems upright or horizontal, not inverted.

B. Provide gate valves with tamper switches for shut-off or isolating service.

C. Provide drain valves at main shut-off valves, low points of piping and apparatus.

D. Place pipe runs to minimize obstruction to other work.

E. All system gauges and valves must be accessible for inspection and maintenance per NFPA 13.

**3.03 INSTALLATION - COORDINATION**

A. Coordinate all electrical requirements of the sprinkler system with general and electrical contractors prior to beginning work.

B. Coordinate all space requirements for sprinkler system equipment, including risers, valves, drains, etc., with the general contractor prior to beginning work.

C. Coordinate all site utility requirements to meet NFPA 13 and the local code requirements of the authority having jurisdiction, prior to beginning work, such that a properly functioning sprinkler system is provided.

D. Coordinate exact location of ESFR heads with lights, ductwork, conduit, pipes, and structural elements to meet the installation requirements of NFPA 13 prior to beginning work.

**3.04 CLEANING**

A. Flush entire piping system for foreign matter.

### 3.05 SYSTEM TESTS

A. Hydrostatically test entire system in accordance with NFPA 13, NFPA 24, and local authority requirements.

B. Test shall be witnessed by authority having jurisdiction, Owner's insurance underwriter and Architect.

C. Provide owner with notarized certificate of material and testing.

**END OF SECTION**

# SECTION 21 31 13
# FIRE PUMPS

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Fire pump package.

B. Fire pump motor.

C. Electric jockey pump.

D. Controllers.

### 1.02 RELATED SECTIONS

A. Section 21 10 00 - Water Based Fire Protection Systems.

B. Section 26 01 00 - Electrical General Provisions.

C. Section 26 05 00 - Basic Materials and Methods.

D. Section 26 24 00 - Service and Distribution.

### 1.03 REFERENCES

A. Factory Mutual System (FM) - Approval Guide.

B. NEMA MG-1 - Motors and Generators.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volt Maximum).

D. NFPA 20 - Installation of Centrifugal Fire Pumps.

E. NFPA 24 - Private Fire Service Mains and their Appurtenances.

F. UL - Fire Protection Equipment Directory.

G. UL 448 - Pumps for Fire Protection Service.

H. UL 778 - Motor Operated Water Pumps.

### 1.04 SYSTEM DESCRIPTION

A. Electric motor driven, single stage, close coupled, horizontal, split-case fire pump with jockey pump and electric controllers.

### 1.05 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate layout, general assembly, components, dimensions, weights, clearances, and methods of assembly.

C. Product Data: Provide manufacturers literature including general assembly, pump curves showing performance characteristics with pump and system, operating point indicated, NPSH curve, controls, wiring diagrams, and service connections.

D. Manufacturer's Installation Instruction: Indicate support details, connection requirements, and include start-up instructions for fire pump.

E. Manufacturer's Certificate: Certify that fire pumps meet or exceed specified requirements at specified operating conditions. Submit summary and results of shop tests performed in accordance with NFPA 20.

F. Field Reports: Indicate summary of hydrostatic test and field acceptance tests performed in accordance with NFPA 20.

### 1.06 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 21.

B. Operation Data: Include manufacturer's instructions, startup data, trouble-shooting check lists, for pumps, drivers, and controllers.

C. Maintenance Data: Include manufacturer's literature, cleaning procedures, replacement parts lists, and repair data for pumps, drivers and controllers.

**1.07 QUALITY ASSURANCE**

A. Perform work in accordance with NFPA 20.

B. Equipment and Components: Bear UL or FM label or marking.

C. Maintain one copy of each document on site.

D. Ensure pump pressure ratings are at least equal to system's maximum operating pressure at pint where installed, but not less than specified.

**1.08 QUALIFICATIONS**

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.

B. Installer: Company specializing in performing the work of this Section with minimum five (5) years documented experience.

C. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. This pump start-up shall be by the pump manufacturer or a certified factory-trained representative per NFPA 20, Section 11-2. This start-up shall include verification of proper installation, system initiation, adjustment and fine tuning. Start-up shall not be considered complete until the sequence of operation, including all alarms has been sufficiently demonstrated to the owner or owner's designated representative. This job site visit shall occur only after all hook-ups, tie-ins, and terminations have been completed and signed off on the manufacturer's start-up request form.

**1.09 REGULATORY REQUIREMENTS**

A. Conform to NFPA 20 for installation and testing of fire pumps, drivers, and controllers.

B. Provide certificate of compliance from authority have jurisdiction indicating approval of field acceptance tests.

**1.10 DELIVERY, STORAGE, AND HANDLING**

A. Delivery, store, protect and handle products to site under provisions of Section 01 10 00.

B. Accept fire pumps and components on site in factory packing. Inspect for damage. Comply with manufacturers rigging and installation instructions.

C. Protect fire pumps and components from physical damage including effects of weather, water, and construction debris.

D. Provide temporary inlet and outlet caps, and maintain in place until installation.

**1.11 MAINTENANCE SERVICE**

A. Furnish service and maintenance of fire pump, driver, and controller for one (1) year from date of Substantial Completion.

B. Provide a minimum one (1) year warranty from the date of operation or eighteen (18) months from the date of shipment on the product, whichever comes first.

**PART 2 PRODUCTS**

**2.01 MANUFACTURER**

A. ITT / AC Pump Company or approved equal.

B. Substitutions: Under provisions of Section 01 62 25.

**2.02 HORIZONTAL BASE MOUNTED PUMPS**

A. Type: UL 448 and UL 778, horizontal shaft, single stage, double suction, direct connected, horizontally split casing, for 250 psig maximum working pressure.

B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze double suction fully enclosed, balanced and keyed to shaft.

D. Bearings: Grease lubricated ball bearings, replaceable without opening casing.

E. Shaft: Alloy steel with replaceable bronze shaft sleeve.

F. Seal: Packing gland with minimum four rings graphite impregnated packing and bronze lantern rings, 230 degrees F (110 degrees C) maximum continuous operating temperature.

G. Drive: Flexible coupling with coupling guard.

H. Baseplate: Fabricated steel with integral drain rim.

I. Performance: As indicated on the Drawings.

**2.03 FIRE PUMP ACCESSORIES**

A. Eccentric suction reducer and OS&Y gate or butterfly valve on suction side of pump.

B. Concentric increaser and check valve in pump discharge and OS&Y gate or butterfly valve on system side of check valve.

C. Fire pump bypass fitted with OS&Y gate or butterfly valves and check valve.

D. Suction pressure gage, 4 1/2 inch diameter dial with snubber, valve cock and lever handle.

E. Discharge pressure gage mounted on board attached to pump, with snubber, valve cock and lever handle.

F. Casing 3/4 inch relief valve.

G. Float operated 3/4 inch automatic air release valve.

H. Hose valve manifold with 2 1/2 inch hose gate valves with caps and chains.

I. Flow metering system for closed loop testing.

**2.04 ELECTRIC MOTOR DRIVE**

A. Refer to Drawings.

**2.05 PRESSURE BOOSTER (JOCKEY) PUMP**

A. Electrically operated, vertical multi-stage, centrifugal, direct coupled type with standard open drip-proof horizontal motor.

B. Performance: As indicated on the Drawings.

C. Control by automatic jockey pump controller with full voltage starter and minimum run timer to start pump on pressure drop in system and stay in operation for minimum period of time. Fire pump shall start automatically on further pressure drop or on jockey pump failure.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For base mounted pumps, provide supports under elbows on pump suction and discharge.

D. Provide drains for bases and seals, piped to and discharging into floor drains.

E. Mount unit on vibration isolators.

F. Provide for connection to electrical service.

G. Lubricate pumps before start-up.

H. Check, align, and certify base mounted pumps by qualified millwright prior to start-up.

**3.02 FIELD QUALITY CONTROL**

A. Perform hydrostatic flow test on entire system in accordance with NFPA 20.

B. Require test to be witnessed by Fire Marshall or authority having jurisdiction.

**END OF SECTION**

# SECTION 22 05 00
# COMMON WORK RESULTS FOR PLUMBING

## PART 1 GENERAL

### 1.01 SUMMARY

A. This Section includes the following:
   1. Piping materials and installation instructions common to most piping systems.
   2. Dielectric fittings.
   3. Mechanical sleeve seals.
   4. Sleeves.
   5. Escutcheons.
   6. Grout.
   7. Supports and anchorages.
   8. Identification

### 1.02 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

### 1.03 SUBMITTALS

A. Welding certificates.

### 1.04 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

### 1.05 MAINTENANCE LOG

A. The contractor shall maintain an appropriate maintenance log, where applicable, of all interim maintenance tasks performed on all equipment started-up and/or operated during construction so that the manufacturer's warranties are not voided prior to the equipment being turned over to the owner. Maintenance logs shall be submitted to the owner as a part of the project close-out documentation when the building is released to the owner.

### 1.06 COORDINATION DRAWINGS

A. The submission of coordination drawings shall be required prior to any equipment/systems installation to ensure that installation conflicts between trades are minimized.

## PART 2 PRODUCTS

### 2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.02 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

G. Solvent Cements for Joining Plastic Piping:

1. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

### 2.03 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig a minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig or minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

### 2.04 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

C. Pressure Plates: Stainless steel, Include two for each sealing element.

D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

### 2.05 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

## 2.06 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
   1. Finish: Polished chrome-plated
   2. Finish: Polished chrome-plated

## 2.07 IDENTIFICATION TAGS AND MARKERS FOR PLUMBING

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with 3/4" tall engraved black letters on light contrasting background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating service and direction of flow (if applicable).

F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

G. Identify the following piping systems:
   1. Domestic Cold Water.
   2. Domestic Hot Water.
   3. Domestic Hot Water Return.
   4. Sanitary Waste and Vent.
   5. A/C Condensate.
   6. Storm Drainage.
   7. Compressed Air.
   8. Acid Waste.
   9. Oxygen.
   10. Argon.
   11. Acetylene.

# PART 3 EXECUTION

## 3.01 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 6 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
   3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Section 07 84 00 - Firestopping for materials.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements. Provide clearances to equipment as required in manufacturer's literature.

S. All piping penetrations of floors, wall, partitions, etc. shall be caulked / sealed full perimeter - regardless of whether or not the wall / partitions is fire rated.

## 3.02 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   3. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

## 3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2" and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2" and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
   4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

## 3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

## 3.05 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

## 3.06 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment 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. Cure placed grout.

## 3.07 PLUMBING IDENTIFICATION DEVICES

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.

B. Plastic Tags: Install with corrosive-resistant chain.

C. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

D. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.

E. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

F. Equipment: water heaters, pumps etc. and associated starters with engraved nameplates. Match the record drawings.

G. Valves: Identify valves in main and branch piping with tags.

H. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Omit only in areas where piping is run exposed to view in finished spaces as determined by the architect. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

**3.08 PROTECTION OF WORK**

A. The contractor must take appropriate precautions during construction to prevent dust and debris from entering water systems by covering equipment and open-ended pipes as the installation progresses.

**3.09 PRESSURE TEST**

A. The results of all piping system pressure test shall be submitted to the construction manager for record purposes.

**END OF SECTION**

# SECTION 22 05 29
# HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Pipe, duct, and equipment hangers, supports, and associated anchors.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

E. Place hanger and support inserts and sleeves.

F. Through-penetration firestopping.

### 1.02 RELATED WORK

A. Section 22 07 00 - Plumbing Insulation.

B. Section 22 11 16 - Domestic Water Piping.

C. Section 22 11 19 - Domestic Water Piping Specialties.

D. Section 22 13 16 - Sanitary Waste and Vent Piping.

### 1.03 REFERENCES

A. ANSI/ASME B31.1 - Power Piping

B. U.L. Fire Resistant Directory. Through Penetration Fire Stop Systems for walls, floors, and partitions.

### 1.04 SUBMITTALS

A. Reference Section 01 33 00 - Shop Drawings, Product Data, Samples.

B. Submit shop drawings and product data.

C. Indicate hanger and support framing and attachment methods.

D. Indicate U.L. system number for all Penetration Systems thru fire rated walls or partitions.

## PART 2 PRODUCTS

### 2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 to 4 inches and Cold Pipe Sizes 6 inches and over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

F. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

G. Floor Support for Pipe Sizes to 4 inches: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support. Grinnell Figure 264 or equal.

H. Shield for Insulated Piping 2-1/2 Inches and Smaller: Finish insulation with vapor barrier mastic. Provide 14 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support. Grinnell Figure 167 or equal. Provide shields for all piping, including piping supported or roller hangers.

I. Shields for Insulated Piping 3 Inches and Larger: Provide foamglass insulation section, 18 inch minimum length, shield thickness same as insulation thickness. Provide 14 gage galvanized sheet shield over insulation in 180 degree segments, minimum 18 inches long at pipe support.

**2.02 PIPE HANGERS AND SUPPORTS MECHANICAL EQUIPMENT ROOM PIPING**

A. Carbon steel adjustable clevis, steel spring and neoprene vibration hanger. Hanger rod shall be capable of swinging thru a 30-degree arc before contacting the hanger box hole and short-circuiting the spring. Mason 30N or equivalent.

B. Seismic bracing for piping in mechanical equipment room, where required, shall be designed and installed using cable restraints in lieu of rigid restraint members to prevent short circuiting the isolation hangers. Isolator supplier shall submit written installation instructions as well as pipe suspension details for restrained and unrestrained applications.

**2.03 HANGER RODS**

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

**2.04 INSERTS**

A. Inserts: Malleable iron case of (galvanized) steel and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

**2.05 SLEEVES**

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with schedule 40 steel pipe.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Schedule 40 steel with U.L. listed fire barrier caulk per the requirements of the U.L. Fire Resistance Directory Fire Stop System.

D. Stuffing or Fire Stopping Insulation: As required by the applicable U.L. System for Through Penetration Fire Stop System.

E. Caulk: Per applicable U.L. Through Penetration Fire Stop Systems.

F. Wrap for insulated piping penetrations of rated walls and floors: Elastomeric intumescent wrap strip per U.L. Fire Resistance Directory - through Penetration Fire Stop Systems.

**2.06 FABRICATION**

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for un-insulated copper piping.

**2.07 FINISH**

A. Prime coat all steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are included.

B. Provide one (1) prime coat and one (1) finish coat of paint on all exterior or interior exposed steel hangers and supports.

**2.08 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION**

A. Systems or devices listed in the U.L. Resistance Directory under categories XHCR and XHEZ shall be used to protect all mechanical piping or conduit (temperature controls) penetrations of fire rated construction, the system used shall conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance. Systems or devices must be asbestos-free.

B. The systems 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.

C. Acceptable manufacturers and products shall be those listed in the U.L. Fire Resistance Directory for the U.L. System involved.

D. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

E. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

## PART 3 EXECUTION

### 3.01 INSERTS

A. Where concrete slabs form finished ceiling, provide inserts to be flush.

### 3.02 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

| PIPE SIZE | MAX.HANGER SPACING | HANGER DIAMETER |
|---|---|---|
| 1/2 to 1-1/4 inch | 6'-6" | 3/8" |
| 1-1/2 to 2 inch | 10'-0" | 3/8" |
| 2-1/2 to 3 inches | 10'-0" | 1/2" |
| 4 to 6 inch | 10'-0" | 5/8" |
| C.I. Bell and Spigot (or No-Hub) | 5'-0" | 5/8" |
| and at all joints PVC | 4'-0" | 3/8" |

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within **12 inches of each horizontal elbow.**

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Support riser piping independently of connected horizontal piping.

I. Size supports large enough to allow for insulation covering. Insulation for all piping shall be continuous at all supports.

### 3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads for all floor mounted equipment. Pads shall be minimum 6" tall and shall be reinforced as called for on the structural drawings. Pads shall be 6" larger than the equipment on all sides. Chamfer edges.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

E. Grout pump bases per the pump manufacturer's recommendations.

F. Provide seismic anchors for all mechanical equipment and associated supports.

### 3.04 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Flash vent and soil pipes projecting 8 inches minimum above finished roof surface with lead worked one inch minimum into pipe, 8 inches minimum clear on sides with 36 x 36 inches sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counterflash and seal. EPDM Roof: Flash per roof manufacturer's recommendation.

C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.

D. Seal Floor and mop sink drains watertight to adjacent materials.

E. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed in accordance with manufacturer's instructions for sound control.

**3.05 SLEEVES**

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

**3.06 SEISMIC BRACING**

A. Provide seismic restraints in accordance with the requirements of the 1999 Standard Building Code for the following:
   1. All natural gas piping.
   2. All other piping in Mechanical Equipment Rooms 1-1/4" diameter and larger, all piping (other than gas) outside Mechanical Equipment Rooms 2-1/2" diameter and larger and all conduits 2-1/2" diameter and larger.
      Exception: Piping suspended by individual hangers 12 inches or less in length, as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.

B. Where possible, hangers and supports for pipes shall not exceed a length of 12 inches.

C. Coordinate bracing methods with vibration isolation systems. Use cable restraints, in accordance with S.M.A.C.N.A. Restraint Manual, to prevent short circuiting vibration isolation devices.

D. Anchor and secure all devices, equipment, tanks, panels, etc. to resist seismic forces.

E. Submittal Data Requirements
   1. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
      a. Descriptive Data:
         1) Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
   2. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
      a. Shop Drawings:
         1) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
         2) Provide all details of suspension and support for ceiling hung equipment.
         3) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
         4) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
      b. Seismic Certification and Analysis:
         1) Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.

2) All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45° to the weakest mode.

3) Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the code required seismic forces acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

**END OF SECTION**

# SECTION 22 07 00
# PLUMBING INSULATION

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Piping Insulation.

B. Jackets and accessories.

### 1.02 RELATED WORK

A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

B. Section 22 11 16 - Domestic Water Piping.

C. Section 22 13 16 - Sanitary Waste and Vent Piping.

### 1.03 REFERENCES

A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.

B. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.

C. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

### 1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in piping insulation application with documented experience.

B. Materials: Flame spread/fuel contributed/smoke developed rating of 25/30/50 in accordance with ASTM E84.

C. Systems: Insulation systems at penetrations of fire rated construction shall be as required by the U.L. Fire Resistance Directory.

### 1.05 SUBMITTALS

A. Submit product data.

B. Include brochure and description list of materials and thickness for each service and locations.

C. Submit manufacturer's installation data.

## PART 2 PRODUCTS

### 2.01 INSULATION

A. Type A: Glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible as manufactured by Owens-Corning.

B. Type B: Tubular closed cell insulation; "K" value of 0.255 at 75 degrees F. equal to Halstead.
   1. Joint Sealant: Closed cell elastomeric tape, 1/8" x 2" wide.
   2. Exterior Sealant: Synthetic resin protective paint.
   3. Pre-slit insulation is not acceptable.

### 2.02 JACKETS AND FITTINGS

A. Kraft reinforced all service jacketing (ASJ) shall be standard on all piping.

B. Aluminum jacketing with aluminum fittings for elbows, etc. as called for.

C. All aluminum jacketing shall be 0.016" thick smooth. Corrugated aluminum jackets are not acceptable.

### 2.03 ACCESSORIES

A. Insulation Bands: 3/4 inch wide; stainless steel or 0.007 inch thick.

B. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.

C. Finishing Cement: ASTM C449.

D. Fibrous Glass Cloth: Untreated; 9 oz/sq yd weight.

E. Adhesives: As directed by manufacturer.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Install materials after piping has been tested and approved.

### 3.02 INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Insulation with vapor barrier through supports and penetrations shall be continuous.

C. In exposed piping, locate insulation and cover seams in least visible locations.

D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

E. On insulated hot water piping: neatly bevel and seal at unions, valves and flow controllers. Seal with manufacturers approved finishing material.

F. Neatly cutout and seal insulation at all cleanouts in drain piping. Seal to maintain insulation system vapor barrier.

G. Provide an insert, (See Supports Section 22 05 29) of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be foamglass or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.

H. Neatly finish insulation at supports, protrusions, and interruptions.

I. Insulation for all cold water piping shall have vapor barrier jackets, factory-applied. Insulate cold water and make-up water fittings, joints and valves with pre-molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive. All insulation at pipe fittings shall be factory pre-molded type.

J. Domestic hot water piping fittings and joints shall be insulated with material and thickness as adjacent piping and finished with PVC covers. Neatly bevel and seal hot water pipe insulation at pumps, unions, valves, etc.

K. All rainleader (roof drain) piping shall be insulated; this includes primary lines, emergency overflow lines, horizontal and vertical piping. Insulation shall be continuous through hangers and supports.

L. Jackets:

1. Indoor, Concealed Applications: Insulated pipes conveying fluids ***above*** ambient temperature shall have standard all service jackets, with or without vapor barrier, factory-applied or field-applied. **Insulate fittings and joints with factory pre-molded insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. No exceptions.** Neatly bevel and seal insulation at valves. PVC fitting covers may be used over pre-molded fitting insulation. PVC elbow covers with fiberglass insulation stuffing **shall not** be used.
2. Indoor, Concealed Applications: Insulated pipes conveying fluids ***below*** ambient temperature shall have vapor barrier jackets, factory-applied. **Insulate fittings, joints, and valves with factory pre-molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive.** PVC jackets are **not** acceptable.
3. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications and provide aluminum jacket for all piping, valves, and fittings.
4. Provide 0.016" smooth aluminum jacket for all type "A" pipe insulation located outside the building and all piping in the mechanical rooms within 6'- 0" of the floor.
5. All exterior exposed portions of closed cell foam (Type "B") insulation shall be protected with minimum 2 coats weatherproof synthetic resin sealant.
6. Insulation with vapor barrier jacket shall not be installed using staples unless same is protected by mastic being applied over staples.

### 3.03 SCHEDULE

| PIPING | TYPE | PIPE SIZE | INSULATION THICKNESS INCH |
|---|---|---|---|
| Domestic Hot Water Supply and Return | A | All | 1" |
| Domestic Cold Water | A | All | 1/2" |
| Condensate Drains | A | All | 1/2" |
| Storm Drain Piping and Roof Drain Bodies | A | All | 1/2" |

Note: Insulation types, thicknesses, density, etc. at penetrations of fire rated construction shall be as required by the U.L. Fire Resistance Directory.

**END OF SECTION**

# SECTION 22 11 16
# DOMESTIC WATER PIPING

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Pipe and pipe fittings.

B. Valves.

C. Domestic water piping system.

### 1.02 RELATED WORK

A. Section 31 22 00 - Structure excavation, backfill and finished grading.

B. Section 09 90 00 - Painting.

C. Section 22 05 00 - Common Work Results for Plumbing.

D. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

E. Section 22 07 00 - Plumbing Insulation.

F. Section 22 11 19 - Domestic Water Piping Specialties.

G. Section 22 40 00 - Plumbing Fixtures.

### 1.03 REFERENCES

A. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

B. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

C. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.

D. ANSI/ASTM B32 - Solder Metal.

E. ANSI/ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

F. ANSI/AWS D1.1 - Structural Welding Code.

G. ASTM B88 - Seamless Copper Water Tube.

### 1.04 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

C. Welders Certification: In accordance with ANSI/ASME Sec. 9, and ANSI/AWS D1.1.

### 1.05 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Include data on pipe materials, pipe fittings, valves and accessories.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## PART 2 PRODUCTS

### 2.01 WATER PIPING, BURIED BELOW CONCRETE SLABS OR PAVED AREAS

A. Copper Tubing: ASTM B88, Type K, hard drawn.

1. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper.

2. Joints: ANSI/ASTM B32.

**2.02 WATER PIPING, ABOVE GRADE**

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper.
   2. Joints: ANSI/ASTM B32, solder, Grade 95TA.

**2.03 FLANGES, UNIONS, AND COUPLINGS**

A. Pipe Size 2 Inches and Under:
   1. Ferrous pipe: 150 psig malleable iron threaded unions.
   2. Copper tube and pipe: 150 psig bronze unions with soldered joints.

B. Pipe Size Over 2 Inches:
   1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
   2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.

C. Grooved and Shouldered Pipe End Couplings:
   1. Housing: Malleable Iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
   2. Sealing gasket: "C" shape composition sealing gasket.

D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.04 BALL VALVES**

A. 2 Inch and Under:
   Equal to Watts LFB-6080 1/4" thru 2", Watts #G-4000-FDA 2-1/2" and larger.

B. Valves shall have stainless steel ball, full port, and extended handle.

**2.05 GATE VALVES**

A. 2-1/2 Inch and Larger:
   Equal to Watts Series 408-OSY-RN, ASTM A126, Class B; MSS-SP70, Federal Spec. WW-V58 Class 1.

**2.06 SWING CHECK VALVES**

A. Manufacturers:
   1. Watts LFCV or approved equal, 90° or 45°, FDA approved rated at 200 PSI WOG.

B. Up to and including 2 Inches: Bronze swing disc, solder or screwed ends.

C. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

**2.07 RELIEF VALVES**

A. Manufacturers:
   1. Watts LF100XL or approved equal.

B. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities AGA and ASME certified and labeled.

**2.08 STRAINERS**

A. Watts or equal FDA approved "Y" Type, rated 200 PSI WOG.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify excavations under provisions of Section 31 22 00.

B. Verify that excavations are to required grade, dry, and not over-excavated.

**3.02 PREPARATION**

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

**3.03 INSTALLATION**

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals and where pipe extends into grade.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance for installation of insulation and access to valves and fittings.

G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.

H. Slope water piping and arrange to drain at low points.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 22 05 00.

K. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum unless otherwise noted. Maintain gradients.

L. Install in accordance with manufacturer's instructions.

M. Establish elevations of buried piping outside the building to ensure not less than one foot of cover.

N. Provide support for utility meters in accordance with requirements of utility companies.

O. Excavate in accordance with Section 31 22 00 for work of this section.

P. Backfill in accordance with Section 31 22 00 for work of this section.

Q. Install valves with stems upright or horizontal, not inverted.

**3.04 APPLICATION**

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install ball valves for throttling, bypass, or manual flow control services.

E. Provide spring loaded check valves on discharge of water pumps.

F. Use grooved mechanical couplings and fasteners only in accessible locations.

G. All valves, supplies, and pipe accessories installed in the domestic water system shall be certified by the manufacturer to meet lead-free requirements.

**3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

A. Prior to starting work, verify system is complete, flushed and clean.

B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

E. Maintain disinfectant in system for 24 hours.

F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C601.

I. Provide documentation from local health department denoting approval of potable water system prior to owner occupying building. No Exceptions!

**END OF SECTION**

# SECTION 22 11 19
# DOMESTIC WATER PIPING SPECIALTIES

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Water hammer arrestors.

B. Hose bibbs.

C. Hydrants.

D. Backflow preventers.

### 1.02 RELATED WORK

A. Section 22 11 16 - Domestic Water Piping.

### 1.03 REFERENCES

A. ANSI A112.26.1 - Water Hammer Arresters.

B. PDI WH-201 - Water Hammer Arresters.

C. ANSI / ASSE 1011 - Hose Connection Vacuum Breakers.

D. ANSI / ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.

### 1.04 QUALITY ASSURANCE

A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

### 1.05 SUBMITTALS

A. Submit under provisions of Section 013300.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

### 1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 0178 21.

B. Record actual locations of equipment, backflow preventers, and concealed valves.

### 1.07 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 0178 21.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 0110 00.

B. Accept specialties on site in original factory packaging. Inspect for damage.

## PART 2 PRODUCTS

### 2.01 WATER HAMMER ARRESTORS

A. Manufacturers:
   1. Watts LF15M2 or equal.
   2. Provide water hammer arrestors on all equipment served by quick action solenoid valves.

B. ASSE 1010 and ANSI A112.26.1; sized in accordance with PDI WH-201.

### 2.02 HOSE BIBBS/HYDRANTS

A. ANSI/ASSE 1019; non-freeze, removable key, and vacuum breaker; as indicated on the drawing.

B. Approved manufacturers: Zurn, Watts, and Woodford

C. All hose bibbs shall be certified as lead-free by the manufacturer.

## 2.03 REDUCED PRESSURE BACKFLOW PREVENTERS

A. Manufacturers: Watts, Zurn, Wilkins
   1. Watts Series 957, 919 or approved equal with bronze strainer and quarter turn ball valves, FDA approved, ASSE No. 1013, AWWA C511-92, CSA B64.5, UL Classified File No. EX3185, IAPMO PS 31, SBCCI.
   2. The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating check valves. Backsiphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel, or directly into the supply pipe via a separate vent. The assembly shall include two tightly closing shutoff valves before and after the assembly, test cocks and a protective strainer upstream of the No. 1 shutoff valve.
   3. All backflow preventers shall be certified by a cross connection control device tester.

# PART 3 EXECUTION

## 3.01 INSTALLATION AND APPLICATIONS

A. Install specialties in accordance with manufacturer's instructions to permit intended performance. Where applicable, consult the manufacturer's technical representative for assistance and review of installation for appropriate function.

B. Install water hammer arrestors complete with accessible isolation valve on hot and cold water piping as recommended by Wade "Sizing and Placement Data". Provide access doors in accordance with Section 08 31 00.

**END OF SECTION**

# SECTION 22 13 16
# SANITARY WASTE AND VENT PIPING

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Pipe and pipe fittings.

B. Valves.

C. Sanitary sewer piping system.

### 1.02 RELATED WORK

A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

B. Section 22 13 19 - Sanitary Waste Piping Specialties.

### 1.03 REFERENCES

A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.

B. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.

C. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.

D. ANSI/ASME Section 9 - Welding and Brazing Qualifications.

E. ANSI/ASTM B32 - Solder Metal

F. ANSI/AWS D1.1 - Structural Welding Code.

G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

H. ASTM A74 - Cast Iron Soil Pipe and Fittings.

I. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated Galvanized), Welded and Seamless, for Ordinary Uses.

J. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.

K. ASTM B306 - Copper Drainage Tube (DWV).

L. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

M. AWS A5.8 - Brazing Filler Metal.

N. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.

O. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.

### 1.04 QUALITY ASSURANCE

A. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

B. Welders Certification: In accordance with ANSI/ASME Sec. 9, and ANSI/AWS D1.1.

### 1.05 SUBMITTALS

A. Include data on pipe materials, pipe fittings, valves and accessories.

### 1.06 DELIVERY, STORAGE, AND HANDING

A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## PART 2 PRODUCTS

### 2.01 SANITARY SEWER AND STORM DRAIN PIPING, BURIED

A. Cast Iron Pipe: ASTM 74 service weight.
   1. Fittings: Cast iron.
   2. Joints: Pre-molded neoprene compression gasketing system.
   3. All pipe and fittings shall be marked with collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

B. PVC Pipe: ASTM D2665, D1785, Schedule 40.
   1. Fittings: PVC
   2. Joints: ASTM D2885, solvent weld with ASTM D2514 solvent cement.

### 2.02 SANITARY SEWER AND STORM DRAIN PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, CISPI 301, hubless, service weight.
   1. Fittings: Cast iron, CISPI 301.
   2. Joints: Heavy duty shielded 4 band type couplings meeting CISPI 301 with stainless steel shield and neoprene gasket.
   3. All pipe and fittings shall be marked with collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

B. PVC Pipe: ASTM D2665, D1785, Schedule 40.
   1. Fittings: PVC
   2. Joints: ASTM D2885, solvent weld with ASTM D2514 solvent cement.
   3. Not for use in return air plenums.

C. All exposed sanitary piping in warehouse area shall be cast iron for durability.

### 2.03 SANITARY SEWER PIPING FOR HANGAR DRAINAGE, BURIED

A. Cast Iron Pipe: ASTM A74, CISPI 301, hubless, service weight.
   1. Fittings: Cast iron, CISPI 301.
   2. Joints: Heavy duty shielded 4 band type couplings meeting CISPI 301 with stainless steel shield and neoprene gasket.
   3. All pipe and fittings shall be marked with collective trademark of the Cast Iron Soil Pipe Institute and listed by NSF International.

### 2.04 ACID WASTE

A. Special drainage systems for corrosive chemical or acid waste shall be manufactured from CPVC Type IV, ASTM Cell Classification 23447. All system pipe and fittings shall be manufactured in accordance with ASTM F 2618 and certified by NSF International for use in corrosive waste drainage systems with the NSF®-cw mark. All pipe and fittings shall be CAN/ULC S102.2 Listed for flame spread of less than 25 and smoke development of less than 50 as designated on the pipe marking or fitting package labeling. All pipe markings shall be accompanied by a yellow stripe for identification of CPVC chemical waste system. All fittings shall be CPVC drainage patterns meeting the requirements of ASTM D 3311 or the manufacturer's specifications, as applicable. Joining method for pipe and fittings shall be solvent cement welding. Solvent cement shall be a "one-step" primerless type CPVC cement specially formulated for resistance to corrosive chemicals and manufactured in accordance with ASTM F 493. All pipe, fittings, and cement shall be supplied together as a system with a Lifetime Warranty, as Spears® LabWaste CPVC Corrosive Waste Drainage Systems manufactured by Spears® Manufacturing Company.

### 2.05 EQUIPMENT DRAINS AND OVERFLOWS (CONDENSATE)

A. Copper Tubing: Seamless copper drainage tube (DWV), Minimum 1 1/4" size.
   1. Fittings: ANSI/ASME B16.23 Cast brass, or ANSI/ASME B16.29 solder wrought copper with wye and brass cleanout plug at all changes in direction.
   2. Joints: soldered joints, using lead-free solder complying with ASTM B32.
   3. Traps: Factory fabricated, deep seal type, mechanical joint.

B. PVC Pipe: ASTM D2665, D1785, Schedule 40.

1. Fittings: PVC
2. Joints: ASTM D2885, solvent weld with ASTM D2514 solvent cement.
3. Not for use in return air plenums.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe. Remove scale and dirt, on inside and outside, before assembly.

### 3.02 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals and where pipe extends into grade.

B. Route piping in orderly manner and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

G. Establish invert elevations, slopes for drainage to 1/8 inch per foot minimum. Maintain gradients.

H. Install bell and spigot pipe with bell end upstream.

I. Group piping whenever practical at common elevations.

J. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Section 22 05 00.

K. Install in accordance with manufacturer's instructions.

L. Establish elevations of buried piping outside the building to ensure not less than one foot of cover.

M. Excavate in accordance with Section 31 22 00 for work of this section.

N. Backfill in accordance with Section 31 22 00 for work of this section.

O. All sanitary piping receiving floor drainage from the aviation hangar shall be cast iron from the catch basin to the oil interceptor.

### 3.03 SERVICE CONNECTIONS

A. Connect to existing sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Field verify exact size, depth and location of all utilities prior to construction.

**END OF SECTION**

# SECTION 22 13 19
# SANITARY WASTE PIPING SPECIALTIES

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Floor drains

B. Cleanouts.

C. Fixture carriers.

### 1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 011000 - Summary of Work: Owner furnished equipment.

### 1.03 RELATED WORK

A. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

B. Section 22 11 16 - Domestic Water Piping.

C. Section 22 40 00 - Plumbing Fixtures.

### 1.04 REFERENCES

A. ANSI/A112.21.1 - Floor Drains.

### 1.05 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

### 1.06 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 78 21.

B. Record actual locations of equipment, cleanouts, backflow preventers and concealed valves.

### 1.07 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 21.

B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.

B. Accept specialties on site in original factory packaging. Inspect for damage.

## PART 2 PRODUCTS

### 2.01 FLOOR DRAINS

A. ANSI A112.21.1; Model type and manufactured as indicated on drawings.

B. Approved manufacturers: Zurn, Watts, Wade.

### 2.02 CLEANOUTS

A. Clean-outs shall be provided in waste and drainage lines where indicated on drawings and/or required by Plumbing Code. Cleanouts shall be sized same as for pipe in which installed, except no clean-out need be larger than 4" in diameter.

B. Where installed in exposed cast iron pipe, cleanouts shall consist of raised-head cast brass plug with caulking ferrule.

C. Cleanouts in walls shall consist of raised head, cast brass plug with stainless steel cover.

D. Where installed in floors, cleanouts shall consist of cast iron ferrule, brass plug, adjustable cast iron housing and nickel brass serrated cover and matching flange for flush mounting. Cleanouts in carpeted areas shall be provided with carpet marker. Outside cleanouts shall be set in a 12" x 12" x 6" thick concrete pad, top of pad shall be flush with finish grade.

E. Approved manufacturers: Zurn, Watts, Wade.

**2.03 FIXTURE CARRIERS**

A. Wall lavatory concealed arm carrier shall be "Zurn" Z1231 lavatory support with concealed arms, complete with Dura-coated rectangular steel uprights with welded feet, cast iron adjustable headers, concealed arms, steel sleeves, alignment truss, and mounting fasteners.

B. Water cooler support system shall be "Zurn" Z1225 with top and bottom plates, complete with dura-coated rectangular steel uprights with welded feet, adjustable support, plates and mounting fasteners.

C. Watts support systems and fixture carriers are an approved substitution.

D. The contractor shall coordinate all carriers and supports and dimensions with the applicable fixture manufacturer to be installed during installation.

E. All fixture carriers shall be extra heavy type and match load rating specified by fixture manufacturer.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Coordinate cutting and forming of floor construction to receive drains to required invert elevations.

**3.02 INSTALLATION AND APPLICATIONS**

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in 2 foot square x 4" thick concrete pad flush with grade, with 1/4 inch clearance between cleanout and pad.

**END OF SECTION**

# SECTION 22 15 13
# GENERAL SERVICES COMPRESSED AIR PIPING

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Compressed Air System.

### 1.02 REFERENCES

A. FS PPP-T-66 - Tape, Packaging, Vinyl Plastic Film.

B. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

C. MIL-STD-101 - Color Code for Pipelines and for Compressed Gas Cylinders.

D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

E. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.

### 1.03 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide manufacturers literature and illustrations for all components indicating size, dimensions and configuration.

C. Independent Testing Agency Reports: Indicate systems are complete, and pressure and cross connections tests performed. Document tests.

D. Manufacturer's Installation Instruction: Indicate requirements for equipment and systems.

### 1.04 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 78 39.

B. Accurately record actual locations of piping, valving, and outlets.

### 1.05 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 23.

B. Operation Data: include installation instructions, assembly views, lubrication instructions, and assembly views.

C. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone.

### 1.06 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 99.

B. Maintain one copy of each document on site.

### 1.07 QUALIFICATIONS

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

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

### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.

B. Accept material on site in factory containers and packing. Inspect for damage.

C. Protect from damage and contamination by maintaining factory packaging and caps in place until installation.

### 1.09 SCHEDULING

A. Schedule work under the provisions of Section 01 31 00.

B. Schedule work to ensure equipment is installed and systems tested and certified prior to substantial completion.

**1.10 WARRANTY**

A. Provide five year warranty under provisions of Section 01 60 00.

**PART 2 PRODUCTS**

**2.01 PIPE AND FITTINGS**

A. Transair aluminum pipe as manufactured by Parker Hannifin.

**2.02 PIPING**

A. Hangers and Supports: MSS SP-58 with types as required by MSS SP-69.

B. Piping Identification: FS PPP-T-66, pressure sensitive adhesive tape and decals, color and labelling to conform with MIL-STD-101

**2.03 OUTLETS**

A. Outlets: Quick disconnect outlets.

B. Written approval of quick disconnect outlets shall be received from owner prior to beginning construction.

**2.04 VALVES**

A. Ball Valves: FS WW-V-35, brass or bronze body, double-seal ball valves with replaceable neoprene or TFE seat and stem seals, for minimum 300 psi working pressure, flange or union mounting, labeled for intended service.

**2.05 ACCESSORIES**

A. Pressure Gages: ANSI B40.1, white dials and black lettering with restrictor, manufactured and labeled expressly for intended service and UL labeled.

B. Flexible Connectors: Corrugated flexible, single ply, seamless or seam-welded tubing of stainless steel or bronze or reinforced TFE bellows or hose.

**2.06 EQUIPMENT**

A. Compressor Unit: Single Stage, heavy duty, flood lubricated, asymmetrical lobe, rotary screw type. Unit equipped with tapered roller bearings for extended bearing life.

B. Motor: Premium Efficient, Open Drip Proof 460V standard NEMA TSC frame, C-flanged, Class F insulation, squirrel cage induction type. 40°C maximum ambient temperature.

C. Drive: Variable Speed Drive, 460V, NEMA 12 with soft start as standard. 230V and 575V are available as an option.

D. Coupling: NEMA C-flanged motor couples direct to compressor unit through non-lubricated, flexible coupling.

E. Inlet Air Filter: Heavy-duty dry type with differential pressure indicator. 99.99% Efficient Per SAE J726C. Oversized for longer life. Element is easily replaced.

F. Air/Fluid Housing & Separation System: ASME 210 PSIG rated tank with ASME pressure relief valve, exclusive fluid filler to prevent overfilling; fluid level sight glass; molded media, high efficiency, long life air / fluid separator element; minimum pressure valve; mounted on vibration isolators.

G. Cooling Lubricating System: Fluid removes heat of compression from compressor unit and is circulated by air pressure differential (no auxiliary pump required) through integral mounted air-cooled or water-cooled heat exchanger and filter. Equipment includes piped air-cooled after-cooled coolers with separate TEFC motor driven fan mounted for updraft discharge or water-cooled after-cooled coolers with water through the tube and air in the shell, moisture separator and electric drain. Full flow fluid filter, fluid thermal bypass valve. "O" ring seals are used on fluid connections. Maximum operating temperature of air-cooled coolers is 40°C (104°F).

H. Fluid Filter: Full flow fluid filter with spin off bowl of ease of service. Filter has replaceable element with high Performance fiberglass media with efficiency rating Beta = 75 Per ISO 16889. Elements are coreless containing no metal for environmentally friendly disposal.

I. Control: Variable Speed Drive (VSD) Control System is used to match compressor output to system demand by controlling compressor speed. Capacity modulation range covers form 100 to 15 percent. Below 15 percent air demand, the machine will unload and shutdown at the same time relieving sump pressure to atmosphere.

J. Protective Devices: High discharge temperature shutdown, low and high sump pressure, motor overload: low Water pressure switch on water-cooled machines, fan motor overload on air-cooled machines.

K. Microprocessor Controller: Air receiver and line pressure readouts, start / stop pushbuttons, power on light, machine running light, service required light, fault light with fault reason display, compressor discharge temperature Readout, air/oil separator delta pressure, run hours, unload pressure, load delta pressure, unload Minutes, condensate drain interval and on time, modulate disable, manual/automatic run selection, language selection, compressor sequencing.

L. Enclosure: Equipped with sound enclosure for low noise emission.

M. General: All components are assembled and mounted as an integral package. Main motor and compressor are mounted on vibration isolators. Corrosion resistant control tubing and fittings are standard.

N. Refrigerated Cycle Dryer: Equal to Sullair" RC-0500-460 sized to match air compressor flow rate.

O. Receiver Tank: Equal to "Sullair" 92-42-620-200 receiver tank.

P. Filters: Equal to Sullair" FX-475 sized to match air compressor flow rate.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and NFPA 99.

B. Pre-Installation Cleaning: Disassemble positive pressure gas systems pipe, fittings, valves, and components, except those supplied cleaned and prepared for intended service, and thoroughly wash in hot solution of sodium carbonate or trisodium phosphate mixed one pound to 3 gallons of water. After washing, rinse with water, dry and cap until installation.

C. Effect changes in size with reducing fittings. Make changes in direction of required turns or offsets with fittings or tubing shaped by bending tools. Bends shall be free of flattening, buckling or thinning of tube wall.

D. Cut pipe and tubing accurately and install without springing or forcing.

E. Grade piping down in direction of flow.

F. Provide pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions. Finish flush at both ends. Extend 2 inches above finished floors. Pack space between pipe or tubing and sleeve, and caulk.

G. Identify piping in accordance with MIL-STD 101, with tape and decals to FS PPP-T-66. Provide piping identification code and schematic. Refer to Section 22 05 00. Labeling shall appear on pipe at intervals of not more than 20 feet and at least once in each room and each story traversed by pipe line.

H. Support gas piping with hangers suitable for size of pipe, spaced:
   1. 1/2 inch pipe or tubing: 72 inches.
   2. 3/4 inch or one inch pipe or tubing: 96 inches.
   3. 1-1/4 inches or larger (horizontal): 120 inches.
   4. 1-1/4 inches or larger (vertical): Every floor level.

I. Provide blowdown drip legs at all low points in the system.

J. Coordinate all outlet locations and mounting heights with owner and equipment manufacturers prior to beginning installation.

K. Provide manufacturer's clearances around air compressors and dryers for service and free area.

L. Provide piped intake on compressors if required by manufacturer's installation instructions.

M. Provide and install all final air filters as required by owner.

**3.02 PIPING SYSTEMS CLEANING AND PRESSURE TESTING**

A. After erection of pipe and tubing but prior to installation of service outlet valves, blow systems clear of free moisture and foreign matter.

B. Install service outlet valves, subject system to test pressure of 150 psig with nitrogen or dry compressed air. Check with soapy water. Provide 24-hour standing pressure test.

**END OF SECTION**

# SECTION 22 34 00
# FUEL-FIRED DOMESTIC WATER HEATERS

## PART 1 GENERAL

### 1.01 SUMMARY

A. This Section includes the following fuel-fired water heaters:
   1. Commercial, power direct-vent, storage, gas water heaters.

### 1.02 RELATED SECTIONS

A. Section 22 05 00 – Common Work Results for Plumbing.

B. Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment.

C. Section 22 07 00 – Plumbing Insulation.

D. Section 22 11 16 – Domestic Water Piping.

### 1.03 REFERENCES

A. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.

B. ASME Section VIIID - Pressure Vessels; Boiler and Pressure Vessel Codes.

C. ANSI/NFPA 30 - Flammable and Combustible Liquids Code.

D. ANSI/NFPA 54 - National Fuel Gas Code.

E. ANSI/NFPA 70 - National Electrical Code.

F. ANSI/UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters.

### 1.04 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Operation and maintenance data.

D. Warranty.

### 1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9" for all components that will be in contact with potable water.

D. Perform work in accordance with State and local standards.

E. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

F. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
   1. American Gas Association (AGA).
   2. National Sanitation Foundation (NSF).
   3. American Society of Mechanical Engineers (ASME).
   4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
   5. National Electrical Manufacturer's Association (NEMA).
   6. Underwriters Laboratories (UL).

G. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

## 1.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired water heaters that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including storage tank and supports.
      b. Faulty operation of controls.
      c. Deterioration of metals, metal finishes, and other materials beyond normal use.
   2. Warranty Period(s): From date of Substantial Completion:
      a. Commercial, Gas Water Heaters: Three years.

## 1.07 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 017823.

B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

## 1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

# PART 2 PRODUCTS

## 2.01 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.02 COMMERCIAL, GAS WATER HEATERS

A. Commercial, Atmospheric, Storage, Gas Water Heaters: Comply with ANSI Z21.10.3/CSA 4.3.
   1. Manufacturers:
      a. Lochinvar.
      b. A.O. Smith.
      c. State Industries, Inc.
      d. Owner shall approve final selection to standardize maintenance and service across multiple sites.
   2. Storage-Tank Construction: ASME-code steel with 150-psig [1035-kPa] working-pressure rating.
      a. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.
         1. NPS 2 (DN 50) and Smaller: Threaded ends according to ASME B1.20.1.
         2. NPS 2-1/2 (DN 65) and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
      b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   3. Factory-Installed, Storage-Tank Appurtenances:
      a. Anode Rod: Replaceable magnesium.
      b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
      c. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
      d. Insulation: Comply with ASHRAE/IESNA 90.1. Surround entire storage tank except connections and controls.
      e. Jacket: Steel with enameled finish.
      f. Burner: For use with atmospheric water heaters and for natural-gas fuel.
      g. Automatic Ignition: ANSI Z21.20, electric, automatic, gas-ignition system.
      h. Temperature Control: Adjustable thermostat.

i. Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

j. Combination Temperature and Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

4. Special Requirements: NSF 5 construction.
5. Draft Hood: Draft diverter; complying with ANSI Z21.12.
6. Automatic Damper: ANSI Z21.66, electrically operated automatic-vent-damper device with size matching draft hood.
7. Energy Management System Interface: Normally closed dry contacts for enabling and disabling water heater.

## 2.03 WATER HEATER ACCESSORIES

A. Gas Shutoff Valves: ANSI Z21.15/CGA 9.1, manually operated. Furnish for installation in piping.

B. Gas Pressure Regulators: ANSI Z21.18, appliance type. Include pressure rating, capacity, and pressure differential required between gas supply and water heater.

C. Gas Automatic Valves: ANSI Z21.21, appliance, electrically operated, on-off automatic valve.

D. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

E. Drain Pans: Corrosion-resistant metal with raised edge. Provide dimensions not less than base of water heater and include drain outlet not less than NPS 3/4 (DN 20).

F. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1 or ASHRAE 90.2.

## 2.04 CIRCULATION PUMP

A. Approved Manufacturers: Grundfos.

B. As scheduled on drawings, suitable for 125 working pressure with:
1. Mechanical shaft seal.
2. 115 V, single phase motor with thermal overload protection.
3. Flexible shaft coupling.

C. Provide Honeywell L4006 series aquastat set to stop pump motor when return line water temperature is 115°F and to start pump when return water temperatures drops to 105°F.

# PART 3 EXECUTION

## 3.01 WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.
1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install gas water heaters according to NFPA 54.
1. Install gas shutoff valves on gas supplies to gas water heaters without shutoff valves.
2. Install gas pressure regulators on gas supplies to gas water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
3. Install automatic gas valves on gas supplies to gas water heaters, if required for operation of safety control.

D. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial, water-heater, relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

E. Install water heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

F. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

H. Fill water heaters with water.

I. Provide dielectric unions at each piping connection to water heaters.

J. HVAC Contractor shall provide combination air and flue gas vents through roof as required.

K. Install condensate drains in downward pitch to floor drains. Provide condensate neutralization kit.

L. Spill relief drains directly over floor drain.

M. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

N. Refer to manufacturer's installation instructions and provide clearances as directed by manufacturer.

**3.02 CONNECTIONS**

A. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

**3.03 FIELD QUALITY CONTROL**

A. Engage a factory-authorized service representative to inspect installation, including connections.

B. Perform the following field tests and inspections:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

**3.04 DEMONSTRATION**

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial water heaters. Refer to Division 01 Section "Demonstration and Training."

**END OF SECTION**

# SECTION 22 40 00
# PLUMBING FIXTURES

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Plumbing fixtures.

### 1.02 RELATED WORK

A. Section 06 41 00 - Architectural Casework.

B. Section 07 90 05 - Joint Sealers.

C. Section 10 28 00 - Toilet and Bath Accessories.

D. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

E. Section 22 11 16 - Domestic Water Piping.

F. Section 22 11 19 - Domestic Water Piping Specialties.

G. Section 22 13 16 - Sanitary Waste and Vent Piping.

H. Section 22 13 19 - Sanitary Waste Piping Specialties.

I. Section 22 33 00 – Electric Domestic Water Heaters.

### 1.03 REFERENCES

A. ANSI/ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public use.

B. ANSI/ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. ANSI/ASME A112.19.1 - Enameled Cast Iron Plumbing Fixtures.

D. ANSI/ASME A112.19.2 - Vitreous China Plumbing Fixtures.

E. ANSI/ASME A112.19.4 - Porcelain Enameled Formed Steel Plumbing Fixtures.

F. ANSI/ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks, and Urinals.

G. ANSI/ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

### 1.04 QUALITY ASSURANCE

A. Fixtures: By same manufacturer for each product specified throughout.

B. Trim: By same manufacturer for each product specified throughout.

### 1.05 SUBMITTALS

A. Submit product data under provisions of Section 01 33 00.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

### 1.06 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 78 21.

B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 10 00.

B. Accept fixtures on site in factory packaging. Inspect for damage.

C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### 1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

B. Confirm that millwork is constructed with adequate provision for the installation of countertop lavatories and sinks.

**1.09 WARRANTY**

A. Provide five year manufacturer's warranty under provisions of Section 01 77 70.

B. Warranty: Include coverage of electric water cooler compressor.

**PART 2 PRODUCTS**

**2.01 PLUMBING FIXTURES**

A. Plumbing fixtures shall be equal to type and manufacturer scheduled on the drawings.

B. Approved manufacturers:
1. Water closets, urinals, lavatories, and service sinks: Kohler, American Standard, Zurn.
2. Drinking fountains: Halsey-Taylor, Oasis and Elkay.
3. Faucets: Kohler, American Standard, Delta, Chicago, Elkay, Kohler, Zurn.
4. Flush Valves: Zurn, Sloan.
5. Sinks: Elkay, Just.
6. Mop Sinks: Stern Williams, Fiat, Florestone.
7. Traps and Supplies: Kohler, Zurn, McGuire, T&S Brass.

C. All faucets, flush valves, and accessories shall be certified as lead-free by the manufacturer.

**PART 3 EXECUTION**

**3.01 INSPECTION**

A. Review millwork shop drawings. Confirm location and size of fixtures and openings **before** rough-in and installation.

B. Verify adjacent construction is ready to receive rough-in work of this Section.

**3.02 EXAMINATION**

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

**3.03 PREPARATION**

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

**3.04 INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Install each fixture with mechanical joint trap, easily removable for servicing and cleaning.

C. Provide chrome plated rigid supplies to fixtures with stops, reducers, and escutcheons.

D. Install components level and plumb.

E. Install and secure fixtures in place with wall supports, wall carriers, and bolts as indicated.

F. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.

G. Cover all floor drains during construction to prevent construction debris from entering the plumbing system.

H. Cap all plumbing waste outlets during construction until fixtures are installed.

I. Mount fixtures to heights as indicated on the drawings.

J. Brass nipples shall be used for wall hung urinal waste outlets. "No Substitute".

K. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.

**3.05 INTERFACE WITH OTHER PRODUCTS**

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

**3.06 ADJUSTING**

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

**3.07 CLEANING**

A. At completion clean plumbing fixtures and equipment.

**3.08 PROTECTION OF FINISHED WORK**

A. Protect all finished work. Replace all damaged fixtures.

**3.09 FIXTURE HEIGHTS**

A. Fixtures shall be mounted at heights as indicated on the architectural drawings.

**3.10 FIXTURE TRAPS**

A. P-traps serving public plumbing fixtures shall meet ASME / ASNI A112.18.1M or IAPMO / UPC requirements. P-traps shall be cast brass construction with adjustable rotation on tube outlet, slip-point inlet, and cleanout plug. The inlet and outlet shall be 1-1/2" O.D.

B. Offset drains serving public plumbing fixture shall meet ASME / ANSI A112.18.1M or IAPMO / UPC requirements. The drain is intended for lavatory installations shall be brass construction with grid drain, 6" offset, and 1-1/4" connection.

**END OF SECTION**

# SECTION 22 61 13
# GENERAL SERVICES GAS PIPING FOR INDUSTRIAL FACILITIES

## PART 1 GENERAL

### 1.01 REFERENCES

A. ANSI B16.18 - Cast Copper Alloy Solder-Joint Pressure Fittings.

B. ANSI B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

C. ASTM B32 - Solder Metal.

D. ASTM B88 - Seamless Copper Water Tube.

E. AWS A5.8 - Brazing Filler Metal.

F. CGA V-5 - Diameter Index Safety System Non Interchangeable Low Pressure Connections for Medical Gas Applications.

G. FM - Factory Mutual System - Approval Guide.

H. FS PPP-T-66 - Tape, Packaging, Vinyl Plastic Film.

I. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

J. MIL-STD-101 - Color Code for Pipelines and for Compressed Gas Cylinders.

K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design and Manufacture.

L. MSS SP-69 - Pipe Hangers and Supports - Selection and Application.

M. NFPA 99 - Standard for Health Care Facilities.

N. UL - Underwriters Laboratories, Inc.

### 1.02 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Provide manufacturers literature and illustrations for all components indicating size, dimensions and configuration.

C. Independent Testing Agency Reports: Indicate systems are complete, and pressure and cross connections tests performed. Document tests.

D. Manufacturer's Installation Instruction: Indicate requirements for equipment and systems.

### 1.3 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 78 39.

B. Accurately record actual locations of piping, valving, and outlets.

### 1.04 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 23.

B. Operation Data: include installation instructions, assembly views, lubrication instructions, and assembly views.

C. Maintenance Data: Include maintenance and inspection data, replacement part numbers and availability, and service depot location and telephone.

### 1.05 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 99.

B. Maintain one copy of each document on site.

### 1.06 QUALIFICATIONS

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

B. Installer:

1. Company specializing in performing the work of this Section with minimum 3 years documented experience.
2. All welders or brazers must be certified by a State of Tennessee recognized testing authority.
3. All welders or brazers shall carry proof of certification while on jobsites.
4. All certification must be current as established by testing authority.

**1.07 DELIVERY, STORAGE, AND HANDLING**

A. Deliver, store, protect and handle products to site under provisions of Section 016000.

B. Accept material on site in factory containers and packing. Inspect for damage.

C. Protect from damage and contamination by maintaining factory packaging and caps in place until installation.

**1.08 SCHEDULING**

A. Schedule work under the provisions of Section 01 31 00.

B. Schedule work to ensure equipment is installed and systems tested and certified prior to substantial completion.

**1.09 WARRANTY**

A. Provide five year warranty under provisions of Section 01 60 00.

**PART 2 PRODUCTS**

**2.01 PIPE AND FITTINGS**

A. Preparation: Wash inside of copper pipe and copper fitting with hot solution of sodium carbonate or trisodium phosphate mixed one pound to 3 gallons of water; rinse with water, and blow dry with oil-free dry nitrogen or compressed air.

B. Oxygen System
1. Copper Tube: ASTM B88, Type K, hard drawn.
2. Fittings: ANSI B16.23, cast bronze, or ANSI B16.29, wrought copper.
3. Joints: AWS A5.8 BCuP silver braze.

C. Argon System
1. Copper Tube: ASTM B88, Type K, hard drawn.
2. Fittings: ANSI B16.23, cast bronze, or ANSI B16.29, wrought copper.
3. Joints: AWS A5.8 BCuP silver braze.

D. Acetylene System
1. Copper Tube: ASTM B88, Type K, hard drawn.
2. Fittings: ANSI B16.23, cast bronze, or ANSI B16.29, wrought copper.
3. Joints: AWS A5.8 BCuP silver braze.

**2.02 PIPING**

A. Hangers and Supports: MSS SP-58 with types as required by MSS SP-69.

B. Piping Identification: FS PPP-T-66, pressure sensitive adhesive tape and decals, color and labelling to conform with MIL-STD-101.

**2.03 OUTLETS**

A. Threaded outlets with ball valve as directed by owner.

**2.04 VALVES**

A. Preparation: For oxygen service, disassemble and wash in hot solution of sodium carbonate or trisodium phosphate mixed one pound to 3 gallons of water, rinse with water, seal, and pack for shipping.

B. Ball Valves: FS WW-V-35, brass or bronze body, double-seal ball valves with replaceable neoprene or TFE seat and stem seals, for minimum 300 psi working pressure, flange or union mounting, labeled for intended service; Model 0207-6300-880 Series as manufactured by Beacon - Medaes.

C. Zone-Valve Box Assemblies: Box with medical gas valves, tube extensions, and gages.

a. Steel Box with Aluminum Cover.
b. Description: Formed steel box with cover, anchors for recessed mounting, holes with grommets in box sides for tubing extension protection, and of size for multiple valves with pressure gages and in sizes required to permit manual operation of valves.
   1) Interior Finish: Factory-applied white enamel.
   2) Cover Plate: Aluminum with frangible or removable windows.
   3) Valve-Box Windows. Clear or tinted transparent plastic with labeling that includes rooms served, according to NFPA 99.

**2.05 PIPING**

A. Hangers and Supports: MSS SP-58 with types as required by MSS SP-69.

B. Piping Identification: FS PPP-T-66, pressure sensitive adhesive tape and decals, color and labelling to conform with MIL-STD-101.

**2.06 ACCESSORIES**

A. Pressure Gages: ANSI B40.1, white dials and black lettering with restrictor, manufactured and labeled expressly for intended service and UL labeled, manufactured by Beacon - Medaes.

B. Flexible Connectors: Corrugated flexible, single ply, seamless or seam-welded tubing of stainless steel or bronze or reinforced TFE bellows or hose.

**2.07 GAS MANIFOLDS**

A. Comply with NFPA 99 for high-pressure medical gas cylinders.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Central Control-Panel Unit: Weatherproof cabinet, supply and delivery pressure gages, electrical alarm-system connections and transformer, indicator lights or devices, manifold connection, pressure changeover switch, line-pressure regulator, shutoff valves, and safety valve.

D. Manifold and Headers: Duplex, nonferrous-metal header for number of cylinders indicated, divided into two equal banks. Units include design for minimum inlet pressure. Include cylinder-bank headers with inlet (pigtail) connections complying with CGA V-1, individual inlet check valves, shutoff valve, pressure regulator, check valve, and pressure gage.

E. Operation: Automatic, pressure-switch-activated changeover from one cylinder bank to the other when first bank becomes exhausted, without line-pressure fluctuation or resetting of regulators and without supply interruption by shutoff of either cylinder-bank header.

F. Mounting: Wall with mounting brackets for manifold control cabinet and headers.

G. Label manifold control unit with permanent label identifying medical gas type and system operating pressure.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install in accordance with manufacturer's instructions and NFPA 99.

B. Pre-Installation Cleaning: Disassemble positive pressure gas systems pipe, fittings, valves, and components, except those supplied cleaned and prepared for intended service, and thoroughly wash in hot solution of sodium carbonate or trisodium phosphate mixed one pound to 3 gallons of water. After washing, rinse with water, dry and cap until installation.

C. Braze joints in piping and tubing. Avoid leaving excess flux inside of pipe and fittings. During brazing of pipe connections, purge interior of pipe continuously with nitrogen.

D. Effect changes in size with reducing fittings. Make changes in direction of required turns or offsets with fittings or tubing shaped by bending tools. Bends shall be free of flattening, buckling or thinning of tube wall.

E. Cut pipe and tubing accurately and install without springing or forcing.

F. Grade piping down in direction of flow.

G. Provide pipe sleeves where pipes and tubing pass through walls, floors, roofs, and partitions. Finish flush at both ends. Extend 2 inches above finished floors. Pack space between pipe or tubing and sleeve, and caulk.

H. Identify piping in accordance with MIL-STD 101, with tape and decals to FS PPP-T-66. Provide piping identification code and schematic. Refer to Section 220500. Labeling shall appear on pipe at intervals of not more than 20 feet and at least once in each room and each story traversed by pipe line.

I. Support gas piping with hangers suitable for size of pipe, spaced:
   1. 1/2 inch pipe or tubing: 72 inches.
   2. 3/4 inch or one inch pipe or tubing: 96 inches.
   3. 1-1/4 inches or larger (horizontal): 120 inches.
   4. 1-1/4 inches or larger (vertical): Every floor level.

**3.02 PIPING SYSTEMS CLEANING AND PRESSURE TESTING**

A. After erection of pipe and tubing but prior to installation of service outlet valves, blow systems clear of free moisture and foreign matter with nitrogen gas.

B. Install service outlet valves, subject system to test pressure of 150 psig with nitrogen or dry compressed air. Check with soapy water. Provide 24-hour standing pressure test.

**3.03 CROSS-CONNECTION TESTS**

A. Independent testing agency to certify system is complete and test performed. Document tests and submit.

B. Test affected zones only. NFPA 99 (1996 Edition) Section 4-3.4.1.1 General.

C. Reduce pressure in piping systems other than system under investigation to atmospheric.

D. Test system with dry compressed air or dry nitrogen with test pressure in piping system at 50 psig.

E. Check each station outlet of every piping system to determine test gas is dispensed only from outlet of system under investigation. Measure pressure with gage attached to specific adaptor. Do not use universal adaptors.

F. Disconnect test gas and connect proper gas to each system. Purge entire system to remove test gas. Check with analyzer suitable for gas installed.

**END OF SECTION**

# SECTION 23 05 00
# COMMON WORK RESULTS FOR HVAC

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Supports and anchorages.
7. Equipment installation requirements common to equipment sections.
8. Concrete bases.
9. Sealing of Duct and Pipe Penetrations.
10. Mechanical Identification.

### 1.02 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

### 1.03 SUBMITTALS

A. Welding certificates.

### 1.04 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

C. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

D. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

E. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

### 1.05 COORDINATION

A. For purposes of clearness and legibility, drawings are essentially diagrammatic, and, although size and location of equipment are drawn to scale wherever possible, the contractor shall make use of all data in all of the contract documents and shall verify this information at the building site. **THE DESIGN DRAWINGS ARE NOT INTENDED AS SHOP DRAWINGS AND THE CONTRACTOR SHALL VERIFY ALL SPACE REQUIREMENTS AND CLEARANCES FOR THE INSTALLATION OF THE MECHANICAL WORK WITH THE WORK OF ALL OTHER**

**TRADES PRIOR TO BEGINNING ANY DUCT OR PIPE FABRICATION OR INSTALLATION.** Failure to properly coordinate all work prior to installation shall result in the contractor correcting all misplaced work at no cost to the Owner.

B. The drawings indicate required size and points of termination of pipes and ducts, and suggest proper routes of pipe to conform to structure, avoid obstructions and preserve clearances. However, it is not intended that drawings indicate all necessary offsets. Install piping and ducts in such a manner as to conform to structure, avoid obstructions, preserve headroom and keep openings and passageways clear without further instruction or cost to the Owner.

C. Shop drawings shall be furnished indicating all changes to meet space requirements, code requirements, and as necessary to resolve all space conflicts.

D. It is intended that all apparatus be located symmetrical with architectural elements, and shall be installed at exact height and locations as shown on the architectural drawings.

E. The Contractor shall fully inform himself regarding any and all peculiarities and limitations of the space available for the installation of all work and materials furnished and installed under the Contract. He shall exercise due and particular caution to determine that all parts of his work are made quickly and easily accessible.

F. In doing all work under this Contract, the Contractor shall carefully protect all existing lines which are to be maintained temporarily in service or which are not to be changed from any damage or discoloration, and shall make good, at his own expense, any damage done to such lines.

G. In performing the work under this Contract, it is possible that the contractor may encounter unknown underground utility lines. Such line may be lines which have or will be abandoned, inactive lines which it may be desired to preserve for future use, or active lines which must be preserved and either relocated or replaced.

H. Should the Contractor encounter any such unknown lines, he shall at once notify the Architect, who will determine whether they have been or may be abandoned or shall be preserved. The Engineer shall determine the character of the lines and, in the case of lines to be preserved, how best to care for them.

I. If the lines are found to have been or may be abandoned, the Contractor shall remove same to the extent necessary as directed by the Architect.

J. If it is found desirable or necessary to preserve the lines, they shall be capped off, relocated or otherwise cared for as directed by the Architect. In general, they shall be done by the trade having jurisdiction, but all contractors shall fully cooperate in such work.

K. All pavements, sidewalks damaged incident to construction work under this Contract shall be replaced by the Contractor as soon as possible in a manner satisfactory to the Architect, Owner, and governing authority, if applicable.

L. All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned, as directed by the manufacturers, unless herein specified to the contrary. Should there by a discrepancy between the installation shown on the drawings and/or specified and the manufacturers' directions and/or recommendations, this must be brought to the Architect's attention, and the procedure settled before proceeding with the work.

M. Contractor shall review each major unit of work to inspect the substrate to receive the work and conditions under which the work is to be performed. The installer shall report all unsatisfactory conditions in writing to the Architect. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

N. Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

O. Inspect each item of materials or equipment immediately prior to installation. Reject damaged and defective items.

P. Provide attachment and connection devices and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow for expansion and building movement.

Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual effect choices to the Architect for final decision.

Q. Recheck measurements and dimensions of the work, as an integral step of starting each installation.

R. Install each unit of work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration. Take the necessary precautions to protect all installed work from ongoing construction and the work of other trades.

S. Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering the work for that purpose.

T. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect for final decision.

U. During handling and installation of work at the project site, clean and protect work in progress and adjoining work at the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

V. Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

## PART 2 PRODUCTS

### 2.01 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

### 2.02 JOINING MATERIALS

A. Refer to individual Division 23 piping sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12.

### 2.03 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

### 2.04 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

**2.05 ESCUTCHEONS**

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.
1. Finish: Polished chrome-plated.

**2.06 IDENTIFICATION TAGS AND MARKERS FOR MECHANICAL**

A. Color: Unless specified otherwise, conform with ANSI/ASME A13.1.

B. Plastic Nameplates: Laminated three-layer plastic with 3/4" tall engraved black letters on light contrasting background color.

C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

D. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.

E. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating service and direction of flow (if applicable).

F. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

**PART 3 EXECUTION**

**3.01 PIPING SYSTEMS - COMMON REQUIREMENTS**

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing. Where large ceiling cavity space exist, locate all valves and specialties within 18 inches of the ceiling access opening.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation. Size hangers for continuous insulation covering unless otherwise indicated.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls and ceilings where exposed to view in all finished spaces.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, concrete floor, roof slabs and where necessary to comply with U.L. at rated wall penetrations.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Install steel pipe for sleeves smaller than 8 inches in diameter.
   2. Install cast-iron "wall pipes" for sleeves 8 inches and larger in diameter.
   3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
   1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials. Also refer to Section 23 05 29.

Q. Verify final equipment locations for roughing-in.

R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

**3.02 PIPING JOINT CONSTRUCTION**

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
   2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
   3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
   4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
   1. Plain-End Pipe and Fittings: Use butt fusion.
   2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

## 3.03 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
   3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dis-similar metals.
   4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.
   5. Provide flanged pipe sections at pipe run outs to large equipment to permit piping to be easily dismantled for equipment removal.

## 3.04 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

B. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

C. Install equipment to allow right of way for piping installed at required slope.

D. Install all equipment per manufacturer's recommendations.

E. Do not locate rooftop mounted equipment to be closer to the edge of the roof than ten feet unless suitable parapet or protective guards are in place as required by the Mechanical Code. Verify all dimensions and clearances prior to final placement of equipment.

F. Ensure sufficient access for service and removal is provided for all mechanical equipment located in attic spaces. Ensure access openings are large enough to permit removal of equipment for replacement.

G. Do not locate HVAC fresh air intakes to be closer than 10 feet to any exhaust fan, exhaust fan discharge cap, flue vent, gas pressure regulator vent or sanitary VTR (coordinate with plumbing contractor). Pipe individual equipment natural gas pressure regulator vents (where applicable) to be minimum 10 feet away or a minimum of two feet higher than OA intake.

## 3.05 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to meet seismic requirements. All concrete bases for equipment shall be properly anchored to the building floor slab.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions. Seismic anchor bolts shall be used unless otherwise indicated.

**3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGES**

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. This contractor shall furnish and install all miscellaneous support members necessary for the proper support of all ductwork, equipment and piping. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment. Secure to the building structure.

C. Field Welding: Comply with AWS D1.1.

**3.07 ERECTION OF WOOD SUPPORTS AND ANCHORAGES**

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

D. Do not install combustible materials in return air plenums.

**3.08 SEALING OF PENETRATIONS**

A. All pipe and duct penetrations of walls, floors and partitions shall be sealed full perimeter to be completely "smoke tight" ; regardless of whether or not the wall, floor or partition is rated. Pipe penetrations of fire rated construction shall be sealed as specified in Section 23 05 29.

**3.09 MECHANICAL IDENTIFICATION DEVICES**

A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners or adhesive.

B. Plastic Tags: Install with corrosive-resistant chain.

C. Stencil Painting (Ductwork only): Apply in accordance with Section 09 90 00.

D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

E. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.

F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.

G. Equipment: fans, air handlers, packaged units, make-up air units, condensing units, unit heaters, etc. and associated starters with engraved nameplates. Match the record drawings.

H. Controls: Identify control panels and major control components outside panels with engraved nameplates.

I. Piping: Identify piping, concealed or exposed, with plastic pipe markers. Omit only in areas where piping is run exposed to view in finished spaces as determined by the architect. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 10 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

J. Ductwork: Identify ductwork with plastic markers or stencil painting with minimum 1" tall letters. Identify air handling unit, or fan served as well as service (supply, return, exhaust, outside air, etc). Omit on exposed ductwork in finished spaces.

K. Identify all duct access panels with stencil lettering per NFPA 90A.

L. Identify all HVAC motor starters with engraved tags.

**END OF SECTION**

# SECTION 23 05 13
# COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

B. Motor Controllers.

### 1.02 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

## PART 2 PRODUCTS

### 2.01 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

### 2.02 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

### 2.03 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.
   1. For motors with 2:1 speed ratio, consequent pole, single winding.
   2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

### 2.04 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multi-speed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.

2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

**2.05 SINGLE-PHASE MOTORS**

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multi-speed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

**2.06 MOTOR CONTROLLERS**

A. It shall be the responsibility of this section to furnish all required starters and motor controllers for all mechanical devices. Starters shall be equipped with all accessory inputs necessary to accomplish the specified sequence of operations.

B. Starters shall be mounted and wired by Division 26.

C. Starters shall be weatherproof where required.

D. Manual Controllers
   1. Manual Motor Controller: NEMA ICS 2,
      AC general-purpose Class A manually operated, full-voltage controller for overload element, red pilot light, auxiliary contact, and push button operator.
   2. 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, pilot light, and toggle operator.

E. Magnetic Controllers
   1. Magnetic starters shall be NEMA 2 or NEMA 4 (combination non-fused for 3-phase motors) type with auxiliary contacts as required to match the specified sequence of control. Starters shall be Furnas, Allen and Bradley or Cutler Hammer- no other substitutes.
   2. Starters shall have solid state overload protection.
   3. Auxiliary contacts shall be normally open or normally closed as required for proper control. Provide integral control transformers when required, with fused primary and secondary. Refer to the sequence of operations for all systems and provide auxiliary contacts at starters as necessary. (Including Fire Alarm System Interlock - Coordinate with Division 28).
   4. Starters for kitchen hood grease exhaust fan and make-up air unit shall be located in the utility enclosure at the hood. Coordinate with hood supplier and fire suppression system contractor.

**PART 3 EXECUTION**

(Not Applicable)

**END OF SECTION**

# SECTION 23 05 29
# HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Pipe, duct, and equipment hangers, supports, and associated anchors.

B. Equipment bases and supports.

C. Sleeves and seals.

D. Flashing and sealing equipment and pipe stacks.

E. Place hanger and support inserts and sleeves.

F. Through-penetration firestopping.

G. Roof Curbs

H. Supports for Miscellaneous Roof Mounted Equipment

I. Penetration Curbs

### 1.02 REFERENCES

A. ANSI/ASME B31.1 - Power Piping

B. U.L. Fire Resistant Directory. Through Penetration Fire Stop Systems for walls, floors, and partitions.

C. Sheetmetal and Air Conditioning Contractor's National Association (SMACNA) - HVAC Duct Construction Standards.

### 1.03 SUBMITTALS

A. Submit shop drawings and product data.

B. Indicate hanger and support framing and attachment methods.

C. Indicate U.L. system number for all Penetration Systems thru fire rated walls or partitions.

## PART 2 PRODUCTS

### 2.01 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and over: Carbon steel, adjustable, clevis. Size clevis for continuous insulation covering for insulated pipes. Refer to 23 07 00.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

E. Vertical Support: Steel riser clamp.

F. Un-insulated Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

G. Shield for Insulated Piping 1 inch and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.

H. Shields for Vertical Copper Pipe Risers: Sheet lead.

I. Floor or Grade Support: Cast iron adjustable pipe saddle with steel support. Floor flange bolted to floor for interior applications, concrete pier for exterior applications

### 2.02 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

### 2.03 INSERTS

A. Inserts: Malleable iron case of (galvanized) steel and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

**2.04 SLEEVES**

A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with schedule 40 steel pipe.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing:

Schedule 40 steel with U.L. listed fire barrier caulk per the requirements of the U.L. Fire Resistance Directory Fire Stop System.

D. Sleeves for Round Ductwork: Form with galvanized steel.

E. Sleeves for Rectangular Ductwork: Form with galvanized steel.

F. Stuffing or Fire Stopping Insulation: As required by the applicable U.L. System for Through Penetration Fire Stop System.

G. Caulk: Per applicable U.L. Through Penetration Fire Stop Systems.

H. Wrap for insulated piping penetrations of rated walls and floors: Elastomeric intumescent wrap strip per U.L. Fire Resistance Directory - through Penetration Fire Stop Systems.

**2.05 FABRICATION**

A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

B. Design hangers without disengagement of supported pipe.

C. Provide copper plated hangers and supports for un-insulated copper piping.

**2.06 FINISH**

A. Prime coat all steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are included.

B. Provide one (1) prime coat and one (1) finish coat of paint on all exterior or interior exposed steel hangers and supports.

**2.07 DUCT SUPPORTS**

A. Ductwork supports, spacing, etc. shall be as directed by SMACNA and the International Mechanical Code. Grease exhaust duct supports shall be in accordance with NFPA 96 and the International Mechanical Code.

B. Furnish and install all supplemental steel supports necessary for the proper support of all ductwork throughout the building. Coordinate with the building structure as required. Submit details of all proposed support systems for ductwork where exposed to view for review and approval prior to beginning and fabrication or installation.

C. All supports for exposed ducts shall be painted. Finished color as directed by the Architect.

**2.08 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION**

A. Systems or devices listed in the U.L. Resistance Directory under categories XHCR and XHEZ shall be used to protect all mechanical piping or conduit (temperature controls) penetrations of fire rated construction, the system used shall conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate instance. Systems or devices must be asbestos-free.

B. The systems 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.

C. Acceptable manufacturers and products shall be those listed in the U.L. Fire Resistance Directory for the U.L. System involved.

D. Fill, void or cavity materials: As classified under category XHHW in the U.L. Fire Resistance Directory.

E. Forming materials: As classified under category XHKU in the U.L. Fire Resistance Directory.

## 2.09 ROOF CURBS (EXCEPT SPRING CURB)

A. All rooftop equipment shall be installed on full perimeter roof mounting curbs sized to match the equipment to be installed per the manufacturer's recommendations. Curbs shall be constructed of **minimum 14 Ga.** Galvanized steel with wood nailer and rigid insulation. Minimum height from the finished roof surface to the top of the curb after installation shall be 12 inches - Coordinate with the height of the tapered roof insulation as shown on the drawings. Adjust curb heights (provide taller curbs) as required to ensure all units are at least 12" above the finished roof surface after installation. **All roof decking and insulation shall be continuous under the packaged rooftop units except for the duct openings.**

B. Provide curb-type equipment support rails for the support of all miscellaneous roof mounted equipment as noted on the plans. Thybar model TEMS or equivalent. Attach to the roof decking or structure per the mfgr's recommendations.

C. Fabrication: Welded 14 gage galvanized steel shell and base, mitered 3 inch cant, or variable step to match roof insulation, 1-1/2 inch thick insulation, and factory installed wood nailer.

D. Top of curbs shall be level, see plans for roof slopes and ridges and / or field verify slopes prior to ordering curbs. Field "shimming" of flat curbs for RTU's to match roof slope shall not be permitted.

## 2.10 SEISMIC SPRING ISOLATION CURBS WITH ACOUSTICAL TREATMENTS

A. Where noted on the plans and schedules, units shall be mounted on full perimeter spring isolation curb with acoustical treatments in lieu of manufacturer's standard roof curb. **All roof decking and insulation shall be continuous under the unit except for the duct openings.** The lower member shall consist of a rectangular steel tube containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of 1/4" thick. Steel springs shall rest on 1/4" neoprene acoustical pads and have a minimum deflection of 1-1/2". **Spring deflection and sizing shall be per the manufacturer's recommendations based on actual project conditions, unit weights, building structure, etc.** Hardware must be cadmium plated or galvanized and the springs plated or provided with an approved rust-resistant finish.

B. Weather proofing shall be provided by a continuous flexible aluminum seal jointed at the corners by EPDM bellows. The aluminum seal must be nailed over and provide counterflashing to the curb's waterproofing. Provision shall be made for access ports with waterproof covers at the spring location and 2" insulation on the sides of the lower curb.

C. The floating member of the roof curb shall have perimeter angle and cross members to support two layers of 5/8" waterproof sheetrock laid on with staggered joints. Sheetrock must surround ducts to provide a continuous sound break. This acoustical barrier shall be caulked to minimize sound transmission. Where the mechanical arrangement makes attachment to the floating member unfeasible, the barrier shall be attached at the highest practical elevation of the fixed curb with provision for 1" thick closed cell neoprene flexible seals around the ductwork. A four inch layer of 1.5 density fiberglass shall cover the entire solid roof surface under the unit. Ductwork shall be lined with sound absorbant material. Complete instructions shall be provided by the spring isolation curb manufacturer.

D. Curbs shall be pitched to match the roof slope and provide a level mounting platform for the units. Minimum curb height - from finished surface of the roof shall be 12 inches.

E. Curbs shall be MASON Industries, Inc. Type RSCA or equivalent.

## 2.11 MISCELLANEOUS MECHANICAL EQUIPMENT SUPPORTS / PENETRATIONS

A. All miscellaneous roof mounted equipment shall be installed on curb-type equipment support rails. Thycurb Model TEMs-1 or equivalent. Rails shall be minimum 12" tall and spacing shall be as required to provide proper level mounting for the equipment - coordinate with equipment manufacturer. Properly anchor equipment to support rails.

B. All piping penetrations of the roof shall be made using weatherproof pipe penetration curbs. Thycurb model TC-1 with removable TP-2 piping cover or equivalent. Seal full perimeter all piping penetrations to be weatherproof. Cut and patch existing roof as required.

## PART 3 EXECUTION

### 3.01 PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as follows:

| PIPE SIZE | MAX. HANGER SPACING | HANGER DIAMETER |
|---|---|---|
| 1/2 to 1-1/4 inch | 6'-6" | 3/8" |
| 1-1/2 to 2 inch | 10'-0" | 3/8" |
| 2-1/2 to 3 inches | 10'-0" | 1/2" |
| 4 to 6 inch | 10'-0" | 5/8" |

B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

C. Place a hanger within **12 inches of each horizontal elbow.**

D. Use hangers with 1-1/2 inch minimum vertical adjustment.

E. Support riser piping independently of connected horizontal piping.

F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

### 3.03 EQUIPMENT BASES AND SUPPORTS

A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

B. Furnish and install all required supplemental supports for equipment, piping, ductwork, etc. Construct supports of steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

C. Provide rigid anchors for pipes after vibration isolation components are installed.

D. Provide seismic anchors for all mechanical equipment and associated supports.

E. Install all roof mounted HVAC air conditioning units (except where noted to be on spring curbs, fans, make-up air units, etc. on full perimeter insulated seismic roof curbs. **All roof decking and insulation shall be continuous under the packaged rooftop units except for the duct openings.** Cut and patch existing roof as required.

F. Install units on seismic spring curbs with acoustical treatments per the manufacturer's recommendations where indicated. Seal gyp bd acoustical treatments around ductwork per the curb mfgr's recommendations for maximum sound attenuation. **All roof decking and insulation shall be continuous under the units except for the duct openings.** Cut and patch existing roof as required.

### 3.04 FLASHING AND SEALING OF PENETRATIONS

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

B. Seal full perimeter **all** duct and pipe penetrations of walls, floors and partitions - whether or not the wall or floor is rated. Seal all exterior wall penetrations full perimeter to be completely weatherproof.

C. Seal all penetrations of smoke walls full perimeter to be completely smoke tight

### 3.05 SLEEVES

A. Set sleeves in position in formwork. Provide reinforcing around sleeves.

**END OF SECTION**

# SECTION 23 05 48
# SEISMIC BRACING FOR HVAC PIPING AND EQUIPMENT

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. This Section includes the following:
   1. Restraining braces, cables and anchors for HVAC Equipment and Piping.
   2. Gas Piping Plan for Local Code Review and Approval
   3. Manufacturer's field observation of seismic component installation with letter of acceptance to local code authority.

### 1.02 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:
   1. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:
   1. As defined by local code and the authority having jurisdiction.
   2. Assigned Seismic Use Group or Building Category as Defined in the Building Code.

### 1.03 SUBMITTALS

A. Submittal Data Requirements
   1. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
      a. Descriptive Data:
         1) Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
         2) Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
      b. Shop Drawings:
         1) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
         2) Provide all details of suspension and support for ceiling hung equipment.
         3) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
         4) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
         5) Provide a **gas piping plan** showing the locations of all required transverse and longitudinal restraints for **all new natural gas piping on this project**. Gas piping plan shall be prepared by the seismic bracing system manufacturer and must be sealed by an Engineer licensed in Tennessee. Submit to the office of local code enforcement with a copy to the architect and engineer.
      c. Seismic Certification and Analysis:
         1) Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
         2) All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location.

Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45° to the weakest mode.

3) Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the code required seismic forces acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

d. Field Services:

1) The seismic bracing manufacturer's representative shall visit the site and observe the installation of the seismic bracing components. Manufacturer's representative shall submit a letter to the office of local code enforcement assuring the proper installation of the seismic bracing components. Letter shall be submitted to local code enforcement prior to the first mechanical inspection and each subsequent inspection per local code requirements.

## 1.04 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the International Building Code unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If pre-approved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

# PART 2 PRODUCTS

## 2.01 SEISMIC-RESTRAINT DEVICES

A. Provide seismic restraints in accordance with the requirements of the International Building Code for the following:

1. **All** natural gas piping. The 12" support rule does not apply to natural gas (high hazard) piping
2. All other piping in Mechanical Equipment Rooms 1-1/4" diameter and larger, all piping (other than gas) outside Mechanical Equipment Rooms 2-1/2" diameter and larger and all conduits 2-1/2" diameter and larger.
   Exception: Piping (other than gas) suspended by individual hangers 12 inches or less in length, (except gas piping) as measured from the top of the pipe to the bottom of the support where the hanger is attached, need not be braced.
3. All ducts with cross-sectional area 6 square foot or larger.
   Exception: No bracing is required if the duct is suspended by hangers 12 inches or less in length, as measured from the top of the duct to the bottom of the support where the hanger is attached. Hangers must be positively attached to the duct within 2 inches of the top of the duct with a minimum of two #10 sheetmetal screws.
4. All Mechanical equipment

B. Restraints for ductwork and piping (where required) shall be in accordance with the S.M.A.C.N.A. Seismic Restraint Manual as applicable for each portion of the work.

C. Where possible, hangers and supports for ducts and pipes shall not exceed a length of 12 inches.

D. Coordinate bracing methods with vibration isolation systems. Use cable restraints, in accordance with S.M.A.C.N.A. Restraint Manual, to prevent short circuiting vibration isolation devices.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products and associated engineering and field observation services that may be incorporated into the work include:

1. Mason Industries

2. Kinetics Noise Control.
3. Hilti, Inc.

F. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

G. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

H. Hanger Rod Stiffener: Reinforcing steel angle clamped] to hanger rod.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

## PART 3 EXECUTION

### 3.01 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

### 3.02 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:
1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by the seismic bracing component manufacturer and the authority having jurisdiction.

B. Piping Restraints:
1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install seismic-restraint devices using methods approved by the seismic bracing component manufacturer and the authority having jurisdiction.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors:
1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre-stressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.

## 3.03 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

## 3.04 FIELD QUALITY CONTROL

A. Manufacturer's representative for all seismic components shall review installation and verify systems are installed in accordance with the manufacturer's recommendation. Submit a review letter for local code enforcement.

## 3.05 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

**END OF SECTION**

# SECTION 23 05 93
# TESTING, ADJUSTING AND BALANCING FOR HVAC

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

### 1.02 REFERENCES

A. AABC - National Standards for Field Measurement and Instrumentation, Total System Balance.

B. ASHRAE - 1984 Systems Handbook: Chapter 37, Testing, Adjusting and Balancing.

C. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

### 1.03 SUBMITTALS

A. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

B. Prior to commencing work, submit draft reports indicating adjusting, balancing, and equipment data required.

C. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.

D. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

E. Include detailed procedures, agenda, sample report forms.

### 1.04 QUALIFICATIONS

A. Independent contractor, **certified by AABC or NEBB** with minimum five years documented experience.

### 1.05 REPORT FORMS

A. Submit reports on AABC National Standards for Total System Balance.

B. Forms shall include the following information:

1. Title Page:
   a. Company name
   b. Company address
   c. Company telephone number
   d. Project name
   e. Project location
   f. Project Architect
   g. Project Engineer
   h. Project Contractor
   i. Project altitude
2. Instrument List:
   a. Instrument
   b. Manufacturer
   c. Model
   d. Serial number
   e. Range
   f. Calibration date
3. Air Moving Equipment:
   a. Location
   b. Manufacturer
   c. Model
   d. Air flow, specified and actual

e. Return air flow, specified and actual
f. Outside air flow, specified and actual
g. Total static pressure (total external), specified and actual
h. Inlet pressure
i. Discharge pressure
j. Fan RPM

4. Fan Data:
   a. Location
   b. Manufacturer
   c. Model
   d. Air flow, specified and actual
   e. Total static pressure (total external), specified and actual
   f. Inlet pressure
   g. Discharge pressure
   h. Fan RPM
5. Electric Motors:
   a. Manufacturer
   b. HP/BHP
   c. Phase, voltage, amperage; nameplate, actual, no load.
   d. RPM
   e. Service factor
   f. Starter size, rating, heater elements
6. Air Distribution Test Sheet:
   a. Air terminal number
   b. Room number/location
   c. Terminal type
   d. Terminal size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i. Test (final) air flow
   j. Percent of design air flow
7. Return Air/Outside Air Data:
   a. Identification/location
   b. Design air flow
   c. Actual air flow
   d. Design return air flow
   e. Actual return air flow
   f. Design outside air flow
   g. Actual outside air flow
   h. Return air temperature
   i. Outside air temperature
   j. Required mixed air temperature
   k. Actual mixed air temperature
   l. Design outside/return air ratio
   m. Actual outside/return air ratio
8. Heat Recovery Wheel Test Data:
   a. Identification / service
   b. Fresh air CFM (design vs. actual)
   c. Exhaust air CFM (design vs. actual)
   d. Outside air temp - Summer (DB / WB)
   e. Return air temp - Summer (DB / WB)
   f. Supply air temp – Summer (DB / WB)
   g. Outside air temp - Winter (DB)

h. Return air temp - Winter (DB)
i. Supply air temp - Winter (DB)
j. Condition of wheel / verify proper rotation

9. DX Cooling Coils
   a. Unit tag and model number
   b. CFM (design vs actual)
   c. Entering air temperature DB/WB (design vs actual)
   d. Leaving air temperature DB/WB (design vs actual)
   e. Outdoor ambient temperature DB/WB at time of test
   f. Condition of coil (clean / dirty)
   g. Wet coil air pressure drop
10. VAV Terminals
   a. Identification tag and model number
   b. Inlet size
   c. Maximum cooling CFM (design vs actual)
   d. Minimum cooling CFM (design vs actual)
   e. Heater KW rating
   f. Heating CFM (design vs actual)
   g. Heating EAT / LAT
   h. Box air pressure drop
11. Make-Up Air Units
   a. Identification tag and model number
   b. CFM (design vs actual)
   c Heating EAT / LAT
   d. Blower horsepower, voltage

## 1.06 QUALITY ASSURANCE

A. Agency shall be company specializing in the adjusting and balancing of systems specified in this Section with minimum five years documented experience. Perform Work under supervision of AABC or NEBB Certified Test and Balance Engineer.

B. Total system balance shall be performed in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE - Systems Handbook.

## 1.07 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

## PART 2 PRODUCTS

A. This part is not used.

## PART 3 EXECUTION

## 3.01 EXAMINATION

A. Before commencing work, verify that systems are complete and operable. Ensure the following:
   1. Equipment is operable and in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Correct fan rotation.
   7. Fire and volume dampers are in place and open.
   8. Coil fins have been cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage has been minimized. (All ducts are sealed)

B. Report any defects or deficiencies noted during performance of services to Architect/Engineer.

C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.

D. If, for design reasons, system cannot be properly balanced, report as soon as observed.

E. Beginning of work means acceptance of existing conditions.

**3.02 PREPARATION**

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

**3.03 INSTALLATION TOLERANCES**

A. Adjust air handling systems to plus or minus 10 percent for supply return and exhaust systems from figures indicated.

**3.04 ADJUSTING**

A. Adjust work as necessary for final balance

B. Recorded data shall represent actually measured, or observed condition.

C. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

G. Check and adjust systems approximately six months after final acceptance and submit report.

**3.05 AIR SYSTEM PROCEDURE**

A. Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities at site altitude.

B. Measure air quantities at air inlets and outlets.

C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

D. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

**END OF SECTION**

# SECTION 23 07 00
# HVAC INSULATION

## PART 1 GENERAL

### 1.01 REFERENCES

A. ANSI / ASTM C547 - Mineral Fiber Pre-Formed Pipe Insulation.

B. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.

C. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

D. ASTM E84 - Surface Burning Characteristics of Building Materials.

E. NFPA 255 - Surface Burning Characteristics of Building Materials.

F. UL 723 - Surface Burning Characteristics of Building Materials.

G. UL - Through Pipe Penetration Directory.

### 1.02 QUALITY ASSURANCE

A. Applicator: Company specializing in ductwork insulation application.

B. Materials: UL listed; flame spread/fuel contributed/smoke developed rating of 25 / 30 / 50 respectively in accordance with ASTM E84.

C. Insulation systems at pipe penetrations of fire rated construction shall be as required by UL - No exceptions. The requirements of UL shall supersede this section where pipes penetrate rated walls or floors.

### 1.03 SUBMITTALS

A. Include product description, list of materials and thickness for each service, and locations.

B. Submit manufacturer's installation instructions under provisions of Section 01 30 00.

### 1.04 DUCT SIZING FOR LINER (RECTANGULAR DUCTS)

A. Duct sizes shown on the drawings are inside sheetmetal dimensions unless noted otherwise. Allowance has been made for internal liner.

## PART 2 PRODUCTS

### 2.01 DUCT INSULATION MATERIALS

A. Acceptable Manufacturer: Owens Corning Fiberglass Corporation.

B. Type "A" flexible glass fiber wrap, ANSI/ASTM C612, commercial grade "K" value of 0.29 at 75 degrees F minimum 0.75 pcf density; 0.002 inch foil scrim facing.

C. Type "B": Flexible glass fiber liner; ANSI/ASTM C553; 'k' value of 0.26 at 75 degrees F; 1.5 lb/cu ft minimum density; coated air side for maximum 4,000 ft/min air velocity.

D. Type "C": Elastomeric External Insulation with 4-ply white Laminate Cover for exterior exposed ducts on the outside of the building. Flexible elastomeric duct wrap sheet insulation with exterior laminate weatherproof, UV resistant **white** covering having zero permeability. Venture Clad 1577CW-T, ArmaCell Arma-Tuff or equivalent. Laminate cover shall carry a 10-year warranty against breakdown of the membrane due to ultra-violet radiation.

E. Adhesives: Waterproof fire-retardant type.

F. Lagging Adhesive: Fire resistive to ASTM E84.

G. Mechanical Liner Pins: Spot welded to duct with integral head or press-on head.

### 2.02 PIPE INSULATION

A. Type A: Glass fiber insulation: ANSI / ASTM C547; 'k' value of 0.24 at 75 degrees F; noncombustible as manufactured by Owens-Corning. All service kraft paper vapor barrier jacket.

B. Type B: Flexible closed cell insulation; "K" valve of 0.255 at 75 degrees F equal to Halstead or Armaflex. Tubular (for piping) or sheet type (for pump bodies, tanks, etc.)

1. Joint Sealant: Closed cell elastomeric tape, 1/8" x 2" wide.
2. Exterior Weatherproof Protective Sealant: Synthetic resin protective paint per mfgr.
3. Pre-slit insulation is not acceptable.

**2.03 PIPE INSULATION ACCESSORIES**

A. Insulation Bands: 3/4 inch wide, stainless steel of 0.007 inch thick.

B. Insulating Cement: ANSI / ASTMC195; hydraulic setting mineral wool.

C. Finishing Cement: ASTM C449.

D. Fibrous Glass Cloth: Untreated; 9 oz / sq yd weight.

E. Weatherproof protective jacketing

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Install materials after ductwork and piping have been tested and approved. Do not install insulation over heat traced piping until heat trace has been tested and approved.

B. Clean surfaces for adhesives.

**3.02 DUCT INSULATION INSTALLATION**

A. Install materials in accordance with manufacturer's instructions.

B. Liner (Type B) Application:
1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners **in addition** to 100% coverage of adhesive. Seal and smooth joints. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Spacing of mechanical fasteners shall be in strict accordance with the manufacturer's recommendations.
2. Ductwork dimensions indicated are inside sheetmetal dimensions. Allowances have been made for any internal ductliner required. Seal all joints and seams in the ductliner system. "Butter" all exposed/trimmed edges.
3. Provide **metal nosing** over exposed liner edges facing the airstream where ducts are indicated on the drawings to terminate with "open ends".

C. Plenum Application:
1. Adhere insulation on interior surface of plenum with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners. Seal and smooth joints. Do not use nail-type fasteners.

D. External Insulation, Type "C"
1. Install per manufacturer's recommendations.
2. Do not install external insulation until duct joints have been sealed.

**3.03 DUCT INSULATION SCHEDULE**

| INSULATION DUCTWORK | TYPE | THICKNESS | FINISH |
|---|---|---|---|
| Rectangular Supply, Return and outside air ducts | B | 1" | None |
| Concealed Round Supply, Return and Outside Air Ducts | A | 2" | FSK |
| Toilet Exhaust Ducts | Not Insulated | - | - |
| NAV Unit Exhaust Ducts Inside the Building | Not Insulated | - | - |

### 3.04 PROTECTION OF WORK - DUCT INSULATION

A. Protect duct insulation at all times from damage and dust accumulation, before and after installation.

B. Protect stored ductliner at the site with protective covers and elevated off the floor. Duct insulation shall not be allowed to get wet and any insulation that does get wet shall be discarded and not installed. Wet insulation shall not be permitted to "dry out" after getting wet. Any insulation allowed to get wet shall be un-acceptable for installation.

C. Protect open ends of ductwork and register openings in ductwork with covers to prevent construction dust build-up on the liner.

### 3.05 PIPING INSULATION INSTALLATION

A. Install materials in accordance with manufacturer's instructions.

B. Continue insulation with vapor barrier through all supports, penetrations, etc. except as noted.

C. In exposed piping, locate insulation and cover seams in least visible locations.

D. Neatly cutout and seal insulation at all cleanouts in drain piping. Seal to maintain insulation system vapor barrier.

E. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.

F. Neatly finish insulation at supports, protrusions, and interruptions.

G. Jackets:

1. Indoor, Concealed Applications: Insulated pipes conveying fluids ***above*** ambient temperature shall have standard all service jackets, with or without vapor barrier, factory-applied or field-applied. Insulate fittings and joints with factory pre-molded insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. No exceptions. Neatly bevel and seal insulation where interrupted for valves, unions, strainers, etc. PVC fitting covers may be used over pre-molded fitting insulation. PVC elbow covers with fiberglass insulation stuffing shall not be used. No mitered elbows.
2. Indoor, Concealed Applications: Insulated pipes conveying fluids ***below*** ambient temperature (refrigerant and condensate drain pipes) shall have vapor barrier jackets, factory-applied. Insulate fittings, joints, and valves with **factory pre-molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive. PVC fitting covers and/or mitered insulation at fittings are not acceptable.**
3. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications.
4. Provide 0.016" smooth weatherproof aluminum jacket for all type "A" pipe insulation located outside the building (pipe and fittings).
5. Type "B" closed cell type insulation shall be tubular and slipped over the pipe as the pipe sections are assembled. Firmly butt and seal insulation joints with mastic sealant per the insulation manufacturer's recommendations. Pre-slit insulation shall not be used.

### 3.06 SCHEDULE

| PIPING | TYPE | PIPE SIZE | INSULATION THICKNESS INCH |
|---|---|---|---|
| Condensate Drains | A or B | All | ¾" |
| Refrigerant Piping | B | All | ¾" |

**END OF SECTION**

# SECTION 23 09 00
# DIGITAL CONTROL SYSTEM

## PART 1 GENERAL

### 1.01 SUMMARY

A. Section Includes:
   1. Related Sections
   2. Description
   3. Approved Control System Contractor
   4. Quality Assurance
   5. Codes and Standards
   6. System Performance
   7. Submittals
   8. Warranty
   9. Ownership of Proprietary Material

### 1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Division 15 - Ductwork Accessories:
   1. Automatic Dampers

### 1.03 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

### 1.04 DESCRIPTION

A. General: The control system shall be as indicated on the drawings and described in the specifications, and consist of a peer-to-peer network of digital building control panels and operator workstation(s). The user interface shall through any personal computer available on the network. The PC shall provide users an interface with the system though dynamic color graphics of building areas and systems.

B. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of systems defined for control on this project.

C. The control system shall accommodate simultaneous multiple user operation. Access to the control system data should be limited by operator ID and password. An operator shall be able to log onto any PC on the designated network and have access to all designated data.

D. The control system shall be designed such that each mechanical system will operate under stand-alone control. As such, in the event of a network communication failure, or the loss of other controllers, the control system shall continue to independently operate the unaffected equipment.

E. Communication between the control panels and all workstations shall be over a high-speed network. All nodes on this network shall be peers.

### 1.05 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS

A. Approved Control System Contractors and Manufacturers:
   1. Trane Tracer or approved equal by Siemens (Apogee Product), Delta Controls (enteli WEB Product), Distech or Automated Logic (Web CTRL Product).
   2. The above list of manufacturers applies to user interface, controller software, the custom application programming language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

### 1.06 QUALITY ASSURANCE

A. System Installer Qualifications
   1. The Installer shall have an established working relationship with the Control System Manufacturer of not less than three years.

2. The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.
3. The installer shall have an office within 60 miles of the project site and provide 24-hour response in the event of a customer call.

**1.07 CODES AND STANDARDS**

A. Work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of local, state and federal authorities. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:
1. National Electric Code (NEC)
2. International Building Code (IBC)
3. International Mechanical Code (IMC)
4. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
5. ANSI/ASHRAE Standard 135-2004 (BACnet)
6. ISO/IEC 14908-1 (LonTalk)

**1.08 SYSTEM PERFORMANCE**

A. Performance Standards. The system shall conform to the following:
1. Page Display. The system shall display a web page will be displayed within 10 seconds of the request.
2. Page Refresh. The system shall update all within 10 seconds.
3. Graphic Refresh. The system shall update all dynamic points with current data within 30 seconds.
4. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds.-
5. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current, within the prior 60 seconds.
6. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 30 seconds.
7. Program Execution Frequency. Custom programs shall be capable of running as often as once every second. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
8. Performance. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
9. Multiple Alarm Annunciations. All users on the network shall receive alarms within 10 seconds of each other.
10. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.
11. Table 1 - Reporting Accuracy

| Measured Variable | Reported Accuracy |
|---|---|
| Space Temperature | ±0.5°C [±1°F] |
| Ducted Air | ±1.0°C [±2°F] |
| Outside Air | ±1.0°C [±2°F] |
| Relative Humidity | ±5% RH |
| Air Flow (terminal) | ±10% of reading *Note 1 |
| Air Flow (measuring stations) | ±5% of reading |
| Air Pressure (ducts) | ±25 Pa [±0.1 "W.G.] |
| Air Pressure (space) | ±3 Pa [±0.01 "W.G.] |
| Carbon Monoxide (CO) | ± 5% of reading |
| Carbon Dioxide (CO2) | ± 50 PPM |

Note 1: (10%-100% of scale) (cannot read accurately below 10%)

## 1.09 SUBMITTALS

A. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats.

B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the contractor from furnishing quantities required for completion.

C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.

D. Submit the following within 60 days of contract award:
   1. A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.
   2. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
   3. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
   4. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:
      a. Building Controllers
      b. Custom Application Controllers
      c. Application Specific Controllers
      d. Operator Interface Computer(s)
      e. Portable Operator Workstation
      f. Auxiliary Control Devices
      g. Proposed control system riser diagram showing system configuration, device locations, addresses, and cabling
      h. Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled
      i. Points list showing all system objects, and the proposed English language object names
      j. Sequence of operations for each system under control. This sequence shall be specific for the use of the Control System being provided for this project

k. Color prints of proposed graphics with a list of points for display Project Record Documents. Upon completion of installation submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

5. Written sequence of operation for all systems and equipment.

E. Project Record Drawings.
1. These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .DWG or .DXF drawing files shall also be provided.
2. Testing and Commissioning Reports and Checklists.
3. Operating and Maintenance (O & M) Manual. These shall be as-built versions of the submittal product data. In addition to that required for the submittals, the O & M manual shall include:
   a. Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
   b. Provide on-line help for documenting operator instructions
   c. A listing and documentation of all custom software created using the programming language including the point database. One set of magnetic media containing files of the software and database shall also be provided.
   d. One set of electronic media containing files of all color-graphic screens created for the project.
   e. Complete original issue documentation, installation, and maintenance information for all third party hardware provided including computer equipment and sensors.
   f. Licenses and warranty documents for all equipment and systems.
   g. Recommended preventive maintenance procedures for all system components including a schedule of tasks, time between tasks, and task descriptions.

F. Training Materials: The Contractor shall provide a course outline and training material for all training classes at least six weeks prior to the first class. The Owner reserves the right to modify any or all of the training course outline and training materials. Review and approval by Owner and Engineer shall be completed at least 3 weeks prior to first class.

## 1.10 WARRANTY

A. Warrant all work as follows:
1. Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.
3. Operator workstation software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by Owner must, however, be granted prior to the installation of such changes.
4. The system provider shall provide a web-accessible system and support on-line resource that provides the Owner access to a question/answer forum, graphics library, user tips, upgrades, and manufacturer training schedules.

## 1.11 OWNERSHIP OF PROPRIETARY MATERIAL

A. All project-developed hardware and software shall become the property of the Owner. Owner shall be provided with backup copies of any and all of these items. These items include but are not limited to:
1. Project graphic images
2. Record drawings
3. Project database
4. Project-specific application programming code
5. All documentation

## PART 2 PRODUCTS

### 2.01 SUMMARY

A. Section Includes:
   1. Materials
   2. Communication
   3. Operator Interface
   4. Application and Control Software
   5. System Controllers
   6. Custom Application Controllers
   7. Application Specific Controllers
   8. Input/Output Interface
   9. Auxiliary Control Devices
   10. Electrical power requirements.

### 2.02 MATERIALS

A. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 1 year. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least 5 years after completion of this contract.

### 2.03 COMMUNICATION

A. This project shall comprise of a network utilizing high-speed BACnet for communications between System Controllers. LonTalk or BACnet MSTP sub-networks shall be used for communications between the System Controllers and Custom Application Controllers or Application Specific Controllers.

B. Unless specified under Division 27 the Owner shall provide all communication media, connectors, repeaters, network switches, and routers necessary for the internetwork. An active Ethernet jack will be provided adjacent to each System Control Panel and PC Workstation for connection to this network.

C. All System Controllers shall have an Ethernet communications port for connections with the operator interfaces.

D. Communications services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:
   1. Connection of an operator interface device to any one System controller on the internetwork will allow the operator to interface with all other System controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all System controllers shall be available for viewing and editing from any one System controller on the internetwork.
   2. All database values (i.e., points, software variable, custom program variables) of any one System controller shall be readable by any other System controller on the internetwork. This value passing shall be automatically performed by a controller when a reference to a point name not located in that controller is entered into the controller's database. An operator/installer shall not be required to set up any communications services to perform internetwork value passing.

E. The time clocks in all System controllers shall be automatically synchronized daily.

### 2.04 OPERATOR INTERFACE

A. The operator shall have access to the system from any PC connected to the Enterprise Wide Network so that a dedicated PC Workstation is not required. These workstations shall reside on the Enterprise wide network, which is same high-speed network as the System controllers. The Enterprise wide network will be provided by the owner and supports the Internet Protocol. PC Workstations must have web browser capabilities as described below in order to interface with the BAS.

B. System software must reside within the customer's network and cannot be remotely hosted.

C. Any controls software that is PC specific must be furnished with multiple copies (no less than 3 copies) to permit the owner to load the software onto multiple owner furnished PC workstations.

D. Workstation information shall be provided via web pages. Each operator workstation shall consist of the following:
   1. Personal Computer shall have internet explorer 7.0 or higher or Firefox 3.0 or higher.

E. User Interface shall consist of the following:
   1. Internet Browser. Furnish with either Internet Explorer 7.0 or higher, or Firefox 3.0 or higher. Java 5.0 or higher must also be installed on the PC.
   2. The system user interface shall be web based graphically orientated. Provide a method for the operator to easily move between web pages. Dynamic points shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation of equipment. Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions. Graphics shall be capable of launching other web pages.
   3. Custom background images. Custom background images shall be created with the use of commonly available graphics packages such as Adobe Photoshop. The graphics generation package shall create and modify graphics that are saved in industry standard formats such as GIF and JPEG.
   4. Furnish a library of standard HVAC equipment such as chillers, air handlers, terminals, fan coils, unit ventilators, rooftop units, and VAV boxes, in 3-dimensional graphic depictions. The library shall be furnished in a file format compatible with the graphics generation package program.

F. Each System controller shall provide storage of system information. Provide the following applications at each System controller:
   1. Database Save and Restore. A system operator with the proper password clearance shall be able to archive the database on the designated operator interface PC. The operator shall also be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.
   2. On-Line Help and Training. Provide a context sensitive, on line help system to assist the operator in operation and editing of the system. On-line help shall be available for all system functions and shall provide the relevant data for that particular screen. Additional help shall be available through the use of hypertext links onscreen.
   3. Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set security levels for all other operators. Each operator password shall be able to restrict the operator's access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. All system security data shall be stored in an encrypted format.
   4. System Diagnostics. The system shall automatically monitor the operation of all, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
   5. Alarm Notification. Operator shall be notified of new alarm as they occur while navigating through any part of the system with an alarm icon. Alarm messages shall use full language, easily recognized descriptors for alarm. System will have the capability to acknowledge Alarms and add and save comments for the alarm.
   6. Alarm Processing. Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.
   7. Alarm Reactions. A user shall be able to determine what actions will occur if any, upon receipt of an alarm. Actions shall display on the screen, logging, start a custom control program, displaying messages, send a SMTP e-mail message that can be directly displayed on a smart phone, or forwarded to a cell phone via a text message. . Each of these actions shall be configurable by any PC and time of day.
   8. Event Log. The operator shall be able to view all logged system alarms and events from any location in the system. The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in up to 4 categories based on severity. An operator with the proper security level

may acknowledge and clear alarms. All that have not been cleared by the operator shall be stored by the building controller. Provide a comment field in the event log that allows a user to add specific comments associated with any alarm.

9. Trend Logs. The system shall automatically create trend logs for a minimum of 5 key measurements for each controlled HVAC device. The automatic trend logs shall monitor these parameters for a minimum of 24 hours at 15 minute intervals. The automatic trend logs shall be user adjustable. A user shall also be able to define a trend log for any data in the system. This definition shall include interval, start-time, and stop-time. Trend intervals shall be as frequently as 1minute up to yearly sampling and shall be selectable. Trend data shall be sampled and stored on the Building Controller panel and can be archived on a PC. Trend data shall be able to be viewed and printed from the operator interface software. Trends must be viewable in a text-based format or graphically. Trends shall also be storable in a CSV or PDF format for use by other industry standard word processing and spreadsheet packages.
10. Dynamic Graphical Trending. The system shall have the ability to save the data collected by a trend object and display that collected data in a graphical chart. Trend viewing capabilities shall include the ability to show up to 6 points on a chart, to include live and/or historical data. Each data point trend line shall be an individual color. Navigation and viewing functions shall include scrolling and zooming of x and y axes, and a trace display of the associated time stamp, and values for any selected point along the x-axis.
11. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system. These statuses shall be available by menu, on graphics or through custom programs.
12. Clock Synchronization. A designated building controller shall synchronize all other building controllers on the network. A building controller shall also be able to synchronize with a NTP server for automatic time synchronization. The system shall automatically adjust for daylight savings time if applicable.
13. Reports and Logs. Provide a reporting package that allows the operator to select reports. A number of different reports shall be available to be selected by the user and provide current data. All reports can be set up to be run at specified intervals of time. Reports and logs shall be stored on the building controller in a format that is readily accessible by other standard software applications including spreadsheets and word processing. Reports and logs shall be readily printed to the system printer. The operator shall be able to designate reports that shall be stored to disk at selectable intervals. Provide a means to list and access the last 10 reports viewed by the user.

G. Each PC workstation shall support dedicated screens for editing of all system applications. Provide editors for each application at the PC workstation. The applications shall be downloaded and executed at the appropriate controller panels.
   1. Controller. Provide a full screen editor for each type custom application and application specific controller that shall allow the operator to view and change the configuration, name, control parameters, and system set-points.
   2. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a monthly calendar for each schedule. Exception schedules and holidays shall be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. An advance and delay time for each object shall be adjustable from this master schedule. An operator shall be able to modify the schedule. Schedules shall be able to be easily copied between objects and/or dates.
   3. Manual Control and Override. Provide a means of manually controlling analog and binary output points. Control overrides shall be performed through a simple procedure. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
   4. Air System Equipment Coordination. Provide editor screens with monitoring and control functions that group together and coordinates the operation of air handling equipment and as specified in the sequence of operations.

## 2.05 APPLICATION AND CONTROL SOFTWARE

A. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the operator workstation.

B. System Security shall consist of the following:
   1. User access shall be secured using individual security passwords and user names.
   2. Passwords shall restrict the user to only the objects, applications, and system functions as assigned by the system administrator
   3. User logon/logoff attempts shall be recorded.
   4. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, optimal start, optimal stop, and night economizer actions. Each schedule may consist of up to [10] events. When a group of objects are scheduled together, provide the capability to define advances and delays for each member. Each schedule shall consist of the following:
   1. Weekly Schedule. Provide separate schedules for each day of the week.
   2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. This exception schedule shall override the standard schedule for that day. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard schedule for that day of the week.
   3. Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
   4. Optimal Start. The scheduling application outlined above shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less then and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

D. Remote Communications. The system shall have the ability to transmit alarms to multiple associated alarm receivers. Receivers shall include PC Workstations, email addresses, and cell phones. The alarm message shall include the name of the alarm location, the device that generated the alarm, and the alarm message itself. The operator shall be able to remotely access and operate the system utilizing the system Ethernet communications, or dial up communications via modem, in the same format and method used on site as described under the Operator Interface section of this specification.

E. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-wind-up shall be supplied. The algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs. The controlled variable, and set-point, shall be user-selectable. The set-point shall optionally be chosen to be a reset schedule.

F. User shall have the option to set the update interval, minimum on/off time, event notification, custom programming on change of events.

G. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, workstation, or the operator display. The amount of time that the override takes precedence will be selectable from the workstation.

H. All binary output points shall be protected from short cycling.

## 2.06 SYSTEM CONTROLLERS

A. General. Provide System Controllers to provide the performance specified in section 1 of this division. All controllers shall fully comply with the following requirements:

1. The System Automation System shall be composed of one or more independent, standalone, microprocessor based System Controllers to manage the global strategies described in System software section.
2. The System Controller shall have sufficient memory to support its operating system, database, and programming requirements.
3. The controller shall provide a USB communications port for connection to a PC.
4. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
5. Controllers that perform scheduling shall have a real time clock.
6. Data shall be shared between networked System Controllers.
7. The System Controller shall utilize industry recognized open standard protocols for communication to unit controllers.
8. The System Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:
   a. Assume a predetermined failure mode.
   b. Generate an alarm notification.
   c. Create a retrievable file of the state of all applicable memory locations at the time of the failure.
   d. Automatically reset the System Controller to return to a normal operating mode.

B. Each System Controller shall reside on the Enterprise wide network, which is same high-speed network as the workstations. The Enterprise wide network will be provided by the owner and supports the Internet Protocol (IP). Local connections of the System Controller shall be on ISO 8802-3 (Ethernet). Each System Controller shall perform communications to a network of Custom Application and Application Specific Controllers using LonTalk FTT-10 and LonMark profiles and/or use BACnet MSTP as prescribed by the BACnet standard to perform communications to a network of Custom Application and Application Specific Controllers.

C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at -40 F to 122 F.

D. Serviceability. Provide diagnostic LEDs for power, communications, and processor. The System Controller shall have a display on the main board that indicates the current operating mode of the controller. All wiring connections shall be made to field removable, modular terminal connectors. The System controller shall utilize standard DIN mounting methods for installation and replacement.

E. Memory. The System Controller shall maintain all BIOS and programming information indefinitely without power to the System controller.

F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage.

## 2.07 CUSTOM APPLICATION CONTROLLERS

A. General. All controllers shall fully comply with the following requirements:
   1. The Controller shall have sufficient memory to support its operating system, database, and programming requirements.
   2. Controllers that perform scheduling shall have a real time clock.
   3. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
   4. The Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode, and generate an alarm notification.
   5. Custom application controllers shall communicate using either LonTalk or BACnet protocols. Controllers using LonTalk protocols shall use FTT-10 transceivers and all communications shall be with the use of LonMark-approved SNVTs and/or profiles as applicable. Custom application

controllers using BACnet protocols shall communicate using BACnet MSTP, ANSI/ASHRAE Standard 135-2004 (BACnet).

B. Environment. Controller hardware shall be suitable for the anticipated ambient conditions:
   1. Controller used in conditioned ambient shall be mounted in IP 20 type enclosures, and shall be rated for operation at 0 C to 50 C [32 F to 120 F].
   2. Controllers used outdoors and/or in wet ambient shall be mounted within IP 56 type waterproof enclosures, and shall be rated for operation at -40 C to 70 C [-40 F to 158 F].

C. Serviceability. Provide diagnostic LEDs for power, communications, and processor. All low voltage wiring connections shall be made such that the controller electronics can be removed and/or replaced without disconnection of field termination wiring.

D. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.

**2.08 APPLICATION SPECIFIC CONTOLLERS**

A. General. Application specific controllers (ASC) are microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable, but are customized for operation within the confines of the equipment they are designed to serve. All controllers shall fully comply with the following requirements:
   1. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
   2. Each ASC will contain sufficient I/O capacity to control the target system.
   3. All ASC devices shall communicate using either LonTalk or BACnet protocols. Devices using LonTalk protocols shall use FTT-10 transceivers and all communications shall be with the use of LonMark-approved SNVTs and/or profiles as applicable. ASCs which do not have a profile that applies must comply with LonMark standards, utilize SNVTs for all listed points, and be provided with a XIF file for self-documentation. Devices using BACnet protocols shall communicate using BACnet MSTP, ANSI/ASHRAE Standard 135-2004 (BACnet).

B. Environment. The hardware shall be suitable for the anticipated ambient conditions.
   1. Controller used in conditioned ambient spaces shall be mounted in IP 20 type rated enclosures. Controllers located where not to be disturbed by System activity (such as above ceiling grid), may be provided with plenum-rated enclosures and non-enclosed wiring connections for plenum cabling. All controllers shall be rated for operation at 0 C to 50 C [32 F to 120 F].
   2. Controllers used outdoors and/or in wet ambient shall be mounted within IP 56 type waterproof enclosures, and shall be rated for operation at -40 C to 65 C [-40 F to 150 F].

C. Serviceability. Provide diagnostic LEDs for power and communications. All wiring connections shall be clearly labeled and made to be field removable.

D. Memory. The Application Specific Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

E. Immunity to Power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.

F. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

**2.09 INPUT/OUTPUT INTERFACE**

A. Hard-wired inputs and outputs may tie into the system through System, Custom, or Application Specific Controllers.

B. All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.

C. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices.

D. Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 3 pulses per second for pulse accumulation, and shall be protected against effects of contact bounce and noise.

E. Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 ma), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.

F. Binary outputs shall provide for on/off operation. Terminal unit and zone control applications may use 2 outputs for drive-open, drive-close (tri-state) modulating control.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 Vdc or a 4-20 ma signal as required to provide proper control of the output device.

## 2.10 AUXILIARY CONTROL DEVICES

A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:
1. Damper frames shall be 16 gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.
3. Damper shaft bearings shall be as recommended by manufacturer for application.
4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.
5. All leakage testing and pressure ratings will be based on AMCA Publication 500.
6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.

B. Control dampers shall be parallel or opposed blade types as scheduled on drawings.

C. Electric damper/valve actuators
1. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
3. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
4. Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
5. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
6. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
7. Actuators shall be Underwriters Laboratories Standard 873 listed.
8. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

D. Binary Temperature Devices
1. Low-Voltage Space Thermostats shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed set point adjustment, 13°C-30°C (55°F-85°F) set point range, 1°C (2°F) maximum differential, and vented cover.
2. Line-Voltage Space Thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed set point adjustment, 13°C-30°C (55°F-85°F) set point range, 1°C (2°F) maximum differential, and vented cover.

3. Low-Limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

E. Temperature Sensors
1. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.
2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5m [5 feet] in length.
3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Space sensors shall be equipped with owner defined limited setpoint adjustment capability, digital display, communication port and manual over-ride switch (occupancy over-ride).
5. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.2 °F.

F. Humidity Sensors
1. Duct and room sensors shall have a sensing range of 20% to 80% with accuracy of ±3% R.H.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. It shall be suitable for ambient conditions of -40 C to 75 C [-40 F to 170 F].
4. Humidity sensor's drift shall not exceed 1% of full scale per year.

G. Static Pressure Sensors
1. Sensor shall have linear output signal. Zero and span shall be field-adjustable.
2. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
3. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.
4. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

H. Low Limit Thermostats
1. Safety low limit thermostats shall be vapor pressure type with an element 6m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any one foot section.
2. Low limit shall be manual reset only.

I. Carbon Dioxide (CO2) Sensors
1. Carbon Dioxide sensors shall measure CO2 in PPM in a range of 0-2000 ppm. Accuracy shall be +/- 3% of reading with stability within 5% over 5 years. Sensors shall be duct or space mounted as indicated in the sequence of operation.

J. Relays
1. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide IP 20 Type enclosure when not installed in local control panel.

K. Transformers and Power Supplies
1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 70.0 mV maximum Peak-to-Peak. Regulation shall be 5% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.

3. Unit shall operate between 0 C and 50 C.
4. Unit shall be UL recognized.

L. Current Switches
1. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

M. Local Control Panels
1. All indoor control cabinets shall be fully enclosed IP 20 Type construction with hinged door, and removable sub-panels or electrical sub-assemblies.
2. Interconnections between internal and face-mounted devices shall be pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Provide on/off power switch with over-current protection for control power sources to each local panel.

## 2.11 ELECTRICAL POWER FOR CONTROLS

A. Refer to the Electrical drawings for 120 volt power in Janitor 125 for HVAC controls.

B. Any additional requirements for 120-volt electrical power for controls shall be the sole responsibility of this section. Controls contractor to coordinate with the electrical subcontractor as required and pay all cost.

# PART 3 EXECUTION

## 3.01 SUMMARY

A. Section Includes:
1. Examination
2. Protection
3. General Workmanship
4. Field Quality Control
5. Wiring
6. Installation of Sensors
7. Warning Labels
8. Identification of Hardware and Wiring
9. Controllers
10. Programming
11 Cleaning
12. Training
13. Acceptance

## 3.02 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

## 3.03 PROTECTION

A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all

open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

**3.04 GENERAL WORKMANSHIP**

A. Install equipment, piping, wiring/conduit parallel to System lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible location as defined by chapter 1 article 100 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

**3.05 FIELD QUALITY CONTROL**

A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to System lines and properly supported.

C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

D. Coordinate all 120 Volt power requirements with electrical subcontractor prior to the start of construction. Division 23 controls contractor to pay all cost for 120 Volt power needs.

**3.06 WIRING**

A. All control and interlock wiring shall comply with the national and local electrical codes and Division 26 of these specifications. Where the requirements of this section differ with those in Division 26, the requirements of this section shall take precedence.

B. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that all wiring is properly supported. All temperature control and interlock wiring shall be installed in conduit where concealed and in-accessible (drops in walls) and where installed exterior to the building.

C. Circuits meet NEC Class 2 (current limited) requirements. (Low voltage power circuits shall be sub fused when required to meet Class 2 current limit.)

D. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.

E. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

F. Where class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 3 m [10 ft] intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 1.5 m [5 ft] intervals or more often to achieve a neat and workmanlike result.

G. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

H. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.

I. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.

J. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.

K. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.

L. Control and status relays are to be located in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.

M. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.

N. Adhere to Division 26 requirements for installation of raceway.

O. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as built) wiring diagrams with terminations identified at the job site.

P. Flexible metal conduits and liquid tight, flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid tight, flexible metal conduits shall be used.

## 3.07 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequate for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Install duct static pressure tap with tube end facing directly down-stream of air flow.

F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.

H. Wiring for space sensors shall be concealed in System walls. EMT conduit is acceptable within mechanical and service rooms.

I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

## 3.08 WARNING LABELS

A. Affix labels on each starter and equipment automatically controlled through the DDC System. Warning label shall indicate the following: CAUTION - This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Affix labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects. Labels shall indicate the following: CAUTION - This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

## 3.09 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1-cm (1/2") letters on nameplates.

D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

## 3.10 CONTROLLERS

A. Provide a separate Controller for each major piece of HVAC equipment. A custom application controller may control more than one system provided that all points associated with that system are assigned to the same controller. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.

B. System Controllers and Custom Application Controllers shall be selected to provide a minimum of 10% spare I/O point capacity for each point type found at each loca¬tion. If input points are not universal, 10% of each type is required. If outputs are not universal, 10% of each type is required. A minimum of one spare is required for each type of point used.

1. Future use of spare capacity shall require providing the field device, field wiring, points database definition, and custom software. No additional Controller boards or point modules shall be required to implement use of these spare points.

## 3.11 PROGRAMMING

A. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25% of available memory free for future use.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

C. Software Programming

1. Provide programming for the system as written in the specifications and adhere to the sequence strategies provided. All other system programming necessary for the operation of the system but not specified in this document shall also be provided by the Control System Contractor. Imbed into any custom-written control programs sufficient comment statements or inherent flow diagrams to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. Operators' Interface

1. Standard Graphics. Provide graphics for each major piece of equipment and floor plan in the System "e.g." – each Air Handler(s), VAV Terminal(s), Fan Coil(s), etc. shall have its own graphic representing the equipment data and state of operation. These standard graphics shall show all points dynamically as specified in the points list.
2. The controls contractor shall provide all the labor necessary to install, initialize, start-up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database, and any third party software installation and integration required for successful operation of the operator interface.
3. As part of this execution phase, the controls contractor will perform a complete test of the operator interface. Test is to include the data accuracy provided on the graphical users interface. Test duration shall be a minimum of 16 hours on-site. Tests shall be made in the presence of the Owner or Owner's representative.

E. Demonstration: A complete demonstration and readout of the capabilities of the monitoring and control system shall be performed. The contractor shall dedicate a minimum of 16 hours on site with the Owner and his representatives for a complete functional demonstration of all the system requirements. This demonstration constitutes a joint acceptance inspection, and permits acceptance of the delivered system for on line operation.

## 3.12 CLEANING

A. This contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

**3.13 TRAINING**

A. Provide a minimum of two (2) classroom training sessions, 4 hours each, throughout the warranty period for personnel designated by the Owner. All training sessions shall be video taped. Provide the owner with two (2) DVD copies of the training sessions as a part of the project closeout documents.

B. Train the designated staff of Owner's representative and Owner to enable them to proficiently operate the system; create, modify and delete programming; add, remove and modify physical points for the system, and perform routine diagnostic and troubleshooting procedures.

C. Additional training shall be available in courses designed to meet objectives as divided into three logical groupings; participants may attend one or more of these, depending on the level of knowledge required:
1. Day-to-day Operators
2. Advanced Operators
3. System Managers/Administrators

D. Provide course outline and materials as per Part 1 of this Section. The instructor(s) shall provide one copy of training material per student.

E. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

F. Classroom training shall be done using a network of working controllers representative of the installed hardware or at the customer's site.

G. This training shall be made available in addition to the interactive audio-visual tutorial, provided with the system.

**3.14 ACCEPTANCE**

A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of both the Engineer and Owner. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

**3.15 DUCT SMOKE DETECTORS FOR FAN SHUTDOWN CONTROL**

A. Duct smoke detectors shall be furnished and wired (FA wiring) by Division 28 Fire Alarm Contractor. HVAC sheetmetal contractor shall mount detectors in the duct. HVAC controls contractor shall furnish and install all required fan shut-down interlock wiring.

B. Duct smoke detectors shall be provided in the HVAC systems as required for fan shut-down control. Detectors shall stop the unit and signal the building fire alarm whenever smoke is detected. Provide duct smoke detectors in the supply and return of the following units:

RTU-3, RTU-4, RTU-20, RTU-24, RTU-25, RTU-26, RTU-27, RTU-28, RTU-29, RTU-30, RTU-31, RTU-32, RTU-35, RTU-36, RTU-37 and RTU-38 as well as AHU-1 and AHU-2 (HVAC Lab).

**PART 4 SEQUENCE OF OPERATION**

**4.01 NEUTRAL AIR VENTILATOR UNITS WITH INTEGRAL HEAT RECOVERY AND HG REHEAT**

A. Each unit shall be furnished with factory mounted and wired digital controller to control all functions of the unit. Unit controller shall include BACnet interface to permit the BAS to monitor the operating parameters of the unit (see 4.10). The unit shall be furnished with a remote control panel capable of all the same functions as the unit mounted controller. The controller shall be connected to the remote control panel located in the space (refer to the drawings). Remote control panel for NAV-1 shall be located in Mechanical/Electrical 18. Remote control panel for NAV-2 shall be located in Mechanical / Electrical 228. Controls contractor to mount and wire the remote control panel as well as all temperature and

humidity sensors required to accomplish the specified sequence of control. Coordinate with local NAV Unit representative.

1. Unit shall operate continuously to provide fresh air to the spaces served during occupied hours. The units shall be off during un-occupied periods. Coordinate beginning of the "occupied" times each day with the start times for the rooftop units served so that the start of the fresh air units lags the starting of the RTU's. This is to permit the RTU's to bring the spaces to the "occupied" setpoint prior to starting the fresh air units.
2. Integral make-up air controls shall operate the units in the cooling/de-humidification/re-heat, heating or ventilation mode as necessary to deliver de-humidified neutral air to the classrooms continuously during occupied hours. All operating controls for neutral air service shall be integral to the unit, including programmable scheduling controls. Set initial occupancy schedule for each unit as directed by the owner for each day of the week. System shall be capable of programming of separate holiday schedules for known holidays when the units may be scheduled to be off.
3. The unit controller shall be a fully digital controller that comes complete with an outside air temperature sensor, a leaving the heat wheel temperature sensor and an outside air humidity sensor which shall be unit mounted and factory wired. The controller also comes complete with a supply air temperature sensor that is to be installed and wired by the installing contractor. The controller shall communicate via BACnet without any gateway required. Startup and programming of the units and controls shall be provided by the unit supplier.
4. When the unit is in the occupied mode (as determined by owner's occupancy schedule) it will have five control modes: economizer, cooling, dehumidification, ventilation, and heating. During all occupied modes the supply fan will be energized, the outside air damper will be open and the exhaust fan shall run. When outside conditions permit based on an outside air enthalpy sensor, the unit will utilize outside air to maintain the desired space conditions. The energy recovery wheel will not run during economizer operation. The energy recovery wheel will run during all other modes.
5. When the outside air dewpoint is above the outdoor air dewpoint setpoint, the unit will be in dehumidification mode. During the dehumidification mode the unit will modulate the digital scroll compressor and cycle the on/off compressors to maintain evaporator coil suction temperature setpoint and modulate the hot gas reheat coil to maintain a neutral 72°F (adjustable) supply air temperature setpoint. Dehumidification mode will take priority over all other modes.
6. When the air leaving the heat wheel is higher than 72°F (as defined by the space temperature sensor) but the outside air dewpoint is below its setpoint, the unit will be in the cooling mode. During the cooling mode, the unit will modulate the digital scroll compressor and cycle the on/off compressors to maintain a 72°F (adjustable) supply air temperature.
7. When the air leaving the heat wheel is below 64°F (adjustable), the unit will be in the heating mode. In the heating mode, the unit will operate in the SCR controlled electric heat to maintain the supply air setpoint.
8. When there is no call for cooling, dehumidification or heating, the unit will be in the ventilation mode. During the ventilation mode the supply fan and exhaust fan shall run.

**4.02 PACKAGED ROOFTOP UNIT SEQUENCE OF OPERATION (Except RTU-24, 25, 35, and 36)**

A. The rooftop units fan shall be started and stopped at predetermined timed each day by the BAS. Hereinafter the fan shall operate continuously - except for RTU's in classrooms and labs served by Neutral Air Ventilators NAV-1 and NAV-2 where the classroom RTU fans shall cycle with the thermostat / humidistat.

B. The heating, cooling and de-humidification (forced cooling with hot gas reheat) shall cycle as required to maintain the space occupied and un-occupied temperature and relative humidity setpoints. All space setpoints shall be set through the BAS. The space sensor shall be furnished with plus and minus 2 degree setpoint offset for temperature. This offset shall be adjustable through the BAS.

C. Provide an override pushbutton on each space temperature sensor to provide operation during unoccupied times. The amount of override time shall be programmable at the BAS.

D. Units 3 tons and larger shall be supplied with factory mounted and wired economizer controls for free cooling when outdoor conditions are suitable. Economizers shall be enthalphy based – no dry bulb economizer controls. All units with economizers shall have power exhaust.

E. Duct smoke detectors (where specified, refer to 3.15) shall stop the unit and signal the building fire alarm whenever smoke is detected.

F. The BAS shall monitor operating parameters of the units (see 4.10).

**4.03 PACKAGED ROOFTOP UNITS SMALLER THAN 3 TONS**

A. Small rooftop units less than 3 tons nominal capacity without factory microprocessor controls capabilities shall be automatically controlled by its respective BACnet compatible space thermostat. Thermostats shall permit the BAS to switch the units from occupied mode to un-occupied mode based on the owner's occupancy schedule each day. The BAS place the systems into the "occupied" mode prior to anticipated occupancy of the spaces to permit the units to bring the spaces to the "occupied" setpoints prior to occupant arrival (and prior to the start of the associated Neutral Air Ventilators where so served).

B. Thermostat shall cycle the unit supply fan along with cooling, gas heating, reverse cycle heating (heat pumps) or auxiliary heat (heat pumps) as required to maintain setpoint.

C. A manual over-ride button on each thermostat shall permit up to three hours occupied operation during normally un-occupied periods.

D. Duct smoke detectors (where specified, refer to 3.15) shall stop the unit and signal the fire alarm whenever smoke is detected.

E. The BAS (via the BACnet thermostat) shall be able to monitor room temperature, room temperature setpoint, unit status (heat or cool) and unit alarm status (smoke detector for fan shut-down) for these units. BAS contractor to furnish and install all required wiring.

**4.04 MULTI-PURPOSE COMMUNITY ROOM UNIT RTU-24**

A. Unit shall be furnished with a fully programmed and wired microprocessor to control all aspects of the unit. Unit controller shall include BACnet interface to permit the BAS to monitor the operating parameters of the unit. The unit shall be furnished with a remote control panel capable of all the same functions as the unit mounted controller. The controller shall be connected to the remote control panel located in the space (Storage 211, refer to the drawings). BAS contractor to mount and wire the remote control panel as well as all temperature, humidity and CO2 sensors required to accomplish the specified sequence of control. BAS contractor shall furnish all required space sensors (not supplied with the unit) as well as all required temperature control and interlock wiring to accomplish the specified sequence of control. Space sensors shall have lock-out feature to prevent unwanted space setpoint adjustments except by facilities personnel.

B. Unit microprocessor controller shall include integral timeclock. Daily occupied/un-occupied settings shall be coordinated with the school.

C. Whenever the unit is placed into occupied mode, the unit supply fan shall start, the unit exhaust fan shall start and the unit outside air and return air dampers shall modulate to provide the minimum outside air (500 CFM) to the space. Unit exhaust fan shall be at minimum speed whenever the unit is operating at the minimum OA setting. Minimum exhaust speed setting shall be balanced during start-up to ensure the unit has sufficient positive pressure.

D. As the multi-purpose room becomes occupied to the point the space CO2 sensor exceeds setpoint (600 ppm), the outside air and return air dampers shall modulate from the minimum CFM setting (500 CFM) to the maximum CFM setting (1,500 CFM) to provide the full ASHRAE 62.1 required amount of ventilation air for a fully populated space. The reverse shall occur and the OA/RA dampers re-set to the minimum occupied CFM setting (500 CFM) whenever the space CO2 level falls below the CO2 sensor setpoint. The unit microprocessor shall proportionally modulate the power exhaust fan based upon outdoor air damper position to prevent the cafeteria from becoming over pressurized as the unit OA increases from the minimum OA setting to the maximum CO2 CFM setting.

E. The unit microprocessor shall control the unit heating, cooling and de-humidification (forced cooling with hot gas reheat) as required to maintain the space temperature and relative humidity setpoints. Furnish and install all required space temperature and relative humidity sensors.

F. The unit microprocessor controller shall operate the unit in economizer mode (enthalpy based) with power exhaust as required when outdoor air conditions are suitable to provide cooling.

G. The unit controller shall have the ability for the exhaust fan speed to be set at different positions based on the minimum OA position, maximum CO2 OA position and the maximum economizer position. Controls contractor shall coordinate with the balance contractor at start-up to ensure proper exhaust fan speeds to prevent the space from being under or over pressurized at each OA setting.

H. When the space is no longer in use, the unit shall switch into un-occupied mode. During un-occupied mode, the unit shall cycle on as needed to maintain the space un-occupied temperature and relative humidity setpoints. During un-occupied operation, the unit shall operate in 100% re-circulation mode (OA damper fully closed).

I. A manual over-ride switch (integral to the space thermostat or separate switch as required) shall be provided to permit the unit to be manually placed into occupied mode for up to three hours should the space need to be used at non-standard times for special events. Unit shall operate as above with minimum outside air unless the space CO2 sensor exceeds setpoint.

J. U.L. listed duct smoke detectors (refer to 3.15) shall stop the unit and signal the building fire alarm whenever smoke is detected.

K. The BAS shall monitor operating parameters of the unit (see 4.10) as well space CO2 level and space CO2 setpoint.

**4.05 COMPOSITE LAB ROOFTOP UNITS RTU-35 AND RTU-36**

A. Units shall be furnished with a fully programmed and wired microprocessor to control all aspects of the units. Unit controller shall include BACnet interface to permit the BAS to monitor the operating parameters of the unit. The unit shall be furnished with a remote control panel capable of all the same functions as the unit mounted controller. The unit controller shall be connected to the remote control panel located in the space (refer to the drawings). BAS contractor to mount and wire the remote control panel as well as all temperature and humidity sensors required to accomplish the specified sequence of control for this unit. BAS contractor shall furnish all required space sensors (not supplied with the unit) as well as all required temperature control and interlock wiring to accomplish the specified sequence of control Space sensors shall have lock-out feature to prevent unwanted space setpoint adjustments except by facilities personnel.

1. RTU-35 shall be interlocked with Exhaust Fan EF-3 to operate in two modes; Make-up air mode whenever EF-3 is "on" and re-circulating mode when EF-3 is "off". RTU-36 shall be interlocked with exhaust fan EF-4 to operate in two modes; make-up air mode whenever EF-4 is "On" and re-circulating mode when EF-4 is "Off".
2. Make-up Air Mode (Exhaust Fan On)
   a. Whenever the lab fume exhaust fan is on, the associated RTU shall operate in make-up air mode for 100% outside air with remote space temperature over-ride. The unit motorized outside air damper shall be open 100% and the unit return air damper shall be closed 100%.
   b. If the space temperature and relative humidity sensors are satisfied, the unit shall deliver heated/cooled and/or de-humidified supply air (100% outside air) to the classroom at a neutral temperature with no re-circulation (similar to the operation of the NAV units except with modulating natural gas heat in lieu of electric heat). All air supplied to the room is exhausted through the exhaust fan.
   c. Unit heating, cooling or de-humidification (forced cooling with hot gas reheat to a neutral supply discharge temperature) shall operate as required to maintain the space heating, cooling and relative humidity setpoints. A call for cooling shall over-ride operation in de-humidification mode.
   d. The BAS shall monitor operating parameters of the unit as well as space temperature and space relative humidity.
3. Re-circulation Mode (Exhaust Fan Off)

a. Whenever the lab fume exhaust fan is off, the associated RTU shall operate in re-circulation mode. The unit motorized outside air and return air dampers shall modulate for approximately 10% OA and 90% RA operation.
b. Unit heating, cooling or de-humidification (forced cooling with hot gas reheat to a neutral supply discharge temperature) shall operate as required to maintain the space heating, cooling and relative humidity setpoints.. A call for cooling shall over-ride operation in de-humidification mode.
c. The system shall permit separate "occupied" and "un-occupied" heating, cooling and relative humidity setpoints and the occupancy schedule for this classroom shall be as directed by the owner. Provide manual over-ride switch at the remote control panel to permit the owner to manually over-ride the timeclock.
d. The BAS shall monitor operating parameters of the unit (see 4.10) as well as exhaust fan status (each fan).

B. U.L. listed duct smoke detectors (refer to 3.15) shall stop the units and signal the building fire alarm whenever smoke is detected. Associated fume exhaust fans shall also be stopped whenever the associated RTU is stopped due to smoke detection.

**4.06 VARIABLE AIR VOLUME ROOFTOP UNIT RTU-25**

A. The fan will be started and stopped at predetermined times each by the BAS. When the fan starts the outside air damper shall open to the preset minimum position. Hereinafter the fan shall operate continuously. As the supply fan speed varies, the outside air damper shall modulate to maintain design outside airflow as measured through an air flow measuring station integral to the unit.

B. The digital controller shall modulate the compressors as required to maintain desired discharge air temperature. When the outside air becomes suitable for cooling the outside air damper shall modulate open as required to maintain desired leaving air temperature. Integral electric heater in the unit shall not allow the mixed air temperature to fall below 50°F (adjustable).

C. The digital controller shall modulate the supply fan variable frequency drive (VFD) as required to maintain desired duct static pressure. Install static pressure sensor approximately two-thirds downstream in the supply duct. Provide a manual reset duct high limit pressure sensor to stop fan anytime the supply duct static pressure rises to an unsafe condition.

D. Power exhaust fan shall modulate as required during economizer operation to prevent the space from being over-pressurized. Provide a differential pressure sensor as required.

E. Furnish and install a differential pressure sensor across the filter for monitoring of the pressure drop at the BAS.

F. Duct mounted smoke detectors shall stop the fan anytime products of combustion are present in the supply or return ducts. Smoke detectors shall be furnished by electrical contractors for mounting and wiring of fan shut-down by this contractor. Refer to 3.15.

G. BAS shall monitor operating parameters of the unit (see 4.10).

**4.07 SERIES FAN POWERED VAV TERMINALS WITH ELECTRIC HEAT**

A. DDC controls for the VAV terminal boxes shall be supplied by the BAS contractor. The VAV box manufacturer shall mount the DDC controls to each box at the factory. All cost per factory mounting the controls shall be the responsibility of the VAV box manufacturer. Refer to Section 23 33 00.

B. Control sequences shall provide continuous fan powered variable air volume control with modulating electric heat and night setback.

C. All air volume setpoints shall be accessible from the BAS.

D. Fans for fan terminal boxes shall be disabled via the BAS whenever the respective primary air handler is stopped on alarm due to the detection of smoke. Systems shall automatically return to "normal" operation whenever the smoke detector alarm condition at the respective air handler is cleared.
1. Occupied Cycle

a. The series terminal fan shall be energized when the central system starts up via an airflow switch integral to the terminal box. Upon central system start up, the fan in the terminal is automatically energized.
b. On a rise in room temperature, the thermostat sends a signal to increase the flow of cold primary air.
c. As more cold air is supplied to the fan section, less warm air is induced from the ceiling space or plenum.
d. When the room temperature exceeds the set point by 2°F or more, cold airflow is maintained at the maximum setting. The maximum setting is the same as the total fan volume setting.
e. On a decrease in room temperature, the thermostat sends a signal to decrease the flow of cold primary air.
f. As less cold air is supplied to the fan section, more warm air is induced from the ceiling space.
g. When the room temperature and thermostat output signal reach the thermostat set point, the cold airflow is at its minimum limit and the fan is supplying the maximum volume of induced air.
h. If room temperature continues to drop, the electric heat shall modulate to heat the space.
i. When the central system is turned off (night-time or weekend), the series terminal fan is shut down upon loss of primary air.

2. Night Setback
   a. An airflow switch de-energizes fan upon loss of primary (central system) air. Upon a call for heat, the thermostat will override the airflow switch and cycle the unit fan and supplementary heat intermittently to maintain the night setback heating set point.

E. BAS shall monitor airflow setpoints. Box airflow, box heating status, room temperature and room temperature setpoint for each box.

**4.08 SPLIT-SYSTEMS (FURNACE AND COIL UNITS)**

A. Small systems without factory microprocessor controls capabilities shall be automatically controlled by its respective BACnet compatible space thermostat. Thermostats shall permit the BAS to switch the unit from occupied mode to un-occupied mode based on the owner's occupancy schedule each day. The BAS places the systems into the "occupied" mode prior to anticipated occupancy of the spaces to permit the units to bring the spaces to the "occupied" setpoints prior to occupant arrival (and prior to the start of the associated Neutral Air Ventilators where so served).

B. Thermostat shall cycle the unit supply fan along with cooling or gas heating as required to maintain setpoint.

C. A manual over-ride button on each thermostat shall permit up to three hours occupied operation during normally un-occupied periods.

D. The BAS (via the BACnet thermostat) shall be able to monitor room temperature, room temperature setpoint, unit status (heat or cool) and unit alarm status (smoke detector for fan shut-down) for these units. BAS contractor to furnish and install all required wiring.

**4.09 MISCELLANEOUS CONTROLS**

A. Electric ceiling heaters, electric unit heaters and electric duct heaters shall all be controlled by their respective low voltage thermostats to maintain space setpoint. Furnish thermostats and all required control wiring. Electric wall heaters shall be supplied with integral unit mounted thermostats.

B. Composite lab fume exhaust fans EF-3 and EF-4 shall be manually started and stopped via a wall mounted pushbutton magnetic starter. Fans shall operate whenever the procedures in the spaces generate fumes. Refer to 4.05 for additional details for the Composite Labs. Starter shall have pilot light to indicate "on" status of the fan. Starter shall include auxiliary contacts for RTU interlock as required. The BAS shall monitor status of each fan. BAS shall automatically stop the exhaust fans and signal an alarm anytime the respective Compsites Lab RTU is stopped due to the detection of smoke.

C. Restroom exhaust fans EF-1 and EF-2 shall be started and stopped each day by the BAS. Fans shall run continuously during occupied periods and shall be off at nights, weekends and scheduled holidays when the building is not occupied. BAS shall monitor status of each fan.

D. Ductless split systems shall be controlled by their respective hard-wired, low voltage thermostat. All controls shall be supplied with the unit.
   1. BAS shall provide temperature sensor in each space served by a DSS unit to monitor space temperature and shall signal an alarm anytime the temperature in the space is 5 degrees (adj) above room setpoint.

E. Summer ventilation fans EF-5 and EF-6 shall be manually controlled by their respective push-button magnetic starter located in the Aviation Lab (hangar).
   1. Starters shall be by Division 23 (Refer to Section 23 05 13) and shall include integral pilot light and auxiliary with controls transformer for 120-volt motorized damper interlock.
   2. Motorized intake dampers at louvers shall be interlocked to open whenever the fans are started, refer to the plans. Multiple louvers serve each fan. Dampers shall close when the fans are switched off.
   3. BAS shall monitor status of each fan.

F. Low intensity gas-fired infra red heaters shall be controlled by their respective low voltage wall thermostat. Thermostats shall be supplied with the heaters and wired by this contractor per the mfgr's recommendations. Each burner assembly shall include a controls transformer and relay. Mount thermostats at 48" AFF. A single thermostat may serve more than one heater is indicated on the plans.
   1. Space sensors shall be mounted adjacent to each heater thermostat in the Aviation bay and wired to the BAS to permit the temperature at each location to be monitored thru the BAS.

G. Gas fired separated combustion unit heater serving the mezzanine storage area in the Aviation lab shall be controlled by a low voltage heating-only wall thermostat. No BAS monitoring required for this heater.

H. Exhaust fan for residential range hood RHD-1 shall be wired to on/off switch on the face of the hood. Fan shall be manually controlled. Wire per the hood mfgr's recommendations. BAS shall monitor status.

I. Electrical room ventilation fans EF-7 and EF-7 shall be controlled by their respective thermostats. Fans shall run anytime the temperature in the electrical room exceeds the thermostat setpoint (85 degrees F). Associated motorized dampers at respective fan intake louver shall be interlocked to open whenever the ventilation fan is on and to close fully when the fan is off. Refer to the drawings. BAS shall monitor status of each fan.

J. Battery charging ventilation fans EF-9 and EF-10 shall be manually controlled by motor-rated on/off switches located in each battery charging area and are intended to operate any time battery charging is taking place. Coordinate wiring of switches with the electrical contractor. Contractor shall install identification placard at each switch with the words

CHARGING AREA VENTILATION FAN

TURN ON ANYTIME CHARGING IS TAKING PLACE

Each switch shall have on and off positions clearly identified and each switch shall have a pilot light to indicate fan operation. BAS shall monitor the status of each fan and shall signal an alarm anytime either fan fails or fails to start when switched to the "on" position manually by the user.

K. Make-up Air Unit MAU-1 shall be interlocked with battery charging ventilation Fan EF-9 to operate whenever the exhaust fan is operating to supply 100% outdoor make-up air to the space to replace the air exhausted by the exhaust fan. Discharge air controls shall control the operation of the direct fired gas heater at the unit to maintain the discharge air at 75 degrees F in winter. BAS shall monitor status of the MAU make-up supply fan as well as the unit discharge air temperature.

L. Make-up Air Unit MAU-2 shall be interlocked with battery charging ventilation Fan EF-10 to operate whenever the exhaust fan is operating to supply 100% outdoor make-up air to the space to replace the air exhausted by the exhaust fan. Discharge air controls shall control the operation of the direct fired gas heater at the unit to maintain the discharge air at 75 degrees F in winter. BAS shall monitor status of the MAU make-up supply fan as well as the unit discharge air temperature.

M. Provide motorized intake/exhaust dampers as shown on the plans for the rotary air compressor. Compressor is to be furnished and installed by the plumbing contractor. HVAC contractor to furnish and install all ductwork, louvers and motorized dampers shown. BAS contractor shall furnish and install all damper controls and thermostats required, including interlock with the compressor. Coordinate with the air compressor supplier prior to beginning and fabrication or installation.

## 4.10 RTU/NAV BAS POINTS SUMMARIES

The following inputs and outputs shall be provided at local controllers serving the equipment shown, and the associated data points shall be made part of the building automation system:

**At each RTU (Except those smaller than 3 tons):**

| | |
|---|---|
| Fan Status | Digital Input |
| Fan Start/Stop | Digital Output |
| Discharge Air Temperature | Analog Input |
| Heating Stage | Digital Output |
| Cooling Stage | Digital Output |
| Room Temperature | Analog Input |
| Room Temperature Setpoint Adjustment | Analog Input |
| Room Temperature Sensor Override | Digital Input |
| Room Relative Humidity | Analog Input |
| Relative Humidity Setpoint | Analog Input |
| Room CO2 level (Community Room Only) | Analog Input |

**At each NAV:**

| | |
|---|---|
| Supply Fan Status | Digital Input |
| Supply Fan Start/Stop | Digital Output |
| Exhaust Fan Status | Digital Input |
| Exhaust fan Start/Stop | Digital Output |
| Discharge Air Temperature | Analog Input |
| Heating Enable | Digital Output |
| Heating Control | Analog Output |
| Cooling Stage(s) | Digital Output(s) |
| Heat Wheel Status | Digital Input |

Note: Individual classroom RTU's shall be identified in the BAS by the unit tag and also by the spaces served. Coordinate actual room numbers with owner / architect prior to project completion. Units serving spaces other than individual classrooms shall be identified by their unit tag (example: RTU-24) and general area served (example: Community Room).

**At VAV Rooftop Unit RTU-25**

| | |
|---|---|
| Outside Air Temperature | Analog Input |
| Outside Air Humidity | Analog Input |
| Outside Air Dewpoint | Analog Input |
| Discharge Air Temperature | Analog Input |
| Supply Duct Static Pressure | Analog Input |
| Supply Fan Start/Stop | Digital Output |
| Building Static Pressure | Analog Input |
| Filter Differential Pressure | Analog Input |
| Supply VFD Signal | Analog Output |
| Supply Fan Status | Digital Input |
| Compressor No. 1 Status | Analog Output |
| Compressor No. 2 Status | Analog Output |
| Compressor No. 3 Status | Analog Output |
| Economizer Position | Analog Output |
| Exhaust Fan Start/Stop | Digital Output |
| Exhaust Fan Status | Digital Input |
| Filter Status | Alarm Output |

| | |
|---|---|
| High Discharge Air Temperature | Alarm Output |
| Low Discharge Air Temperature | Alarm Output |
| High Duct Static Pressure | Alarm Output |
| Fan Failure | Alarm Output |
| **At Each Terminal Box** | |
| Space Identification/Unit Tag | Analog Input |
| Space Temperature Setpoint | Analog Input |
| Space Temperature | Analog Input |
| Terminal Fan Status | Analog Input |
| Airflow | Analog Input |
| Damper Position | Analog Input |
| Heating Output | Digital Output |
| **At Each Fan** | |
| Fan Identification/Tag | Analog Output |
| Fan Status | Digital Input |
| Fan Failure | Alarm Output |

**END OF SECTION**

# SECTION 23 11 23
# NATURAL GAS PIPING

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Natural gas piping

B. Pipe and pipe fittings

C. Valves

D. Painting of exterior exposed piping

### 1.02 RELATED WORK

A. Section 09900 - Painting.

B. Section 23 05 29 - Hanger and Supports for HVAC piping and equipment.

C. Section 23 05 48 - Seismic Bracing For HVAC Piping And Equipment

### 1.03 REFERENCES

A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 NS 300.

B. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.

C. ANSI/AWS D1.1 - Structural Welding Code.

D. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.

E. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless, for Ordinary Uses.

### 1.04 QUALITY ASSURANCE

A. Valves: Manufacturer's names and pressure rating marked on valve body.

B. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.

### 1.05 SUBMITTALS

A. Submit product data under provisions of Sections 01 33 00..

B. Include data on pipe materials, pipe fittings, valves and accessories.

C. Submit gas piping plan with seismic components located as required by local code. Refer to Section 23 05 48.

### 1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 11 00.

B. Store and protect products under provisions of Section 01 11 00.

C. Deliver and store valves in shipping containers with labeling in place.

## PART 2 PRODUCTS

### 2.01 NATURAL GAS PIPING BELOW GRADE

A. Steel Pipe: ASTM A53 or A120, schedule 40 seamless black steel pipe with polyethylene protective wrap. Welded joints. Cathodic protection as recommended by the local utility company.

B. Plastic Pipe: ASTM D1248 Polyethylene pipe subject to the approval of the local Authority having jurisdiction. Joints: ASTM D2513 heat fusion.

### 2.02 NATURAL GAS PIPING ABOVE GRADE

A. Steel Pipe Over 2 Inches, all Concealed Piping and all piping over 7" W.C. pressure: ASTM A53 or A120, Schedule 40 black, seamless. Fittings: ASTM A234, forged steel welding type. Joints: ANSI/AWS D1.1, welded.

B. Accessible Low Pressure Steel Pipe, 2 Inches and Under: ASTM A53 or A120, Schedule 40, black, seamless pipe. Fittings: ANSI/ASME B16.3 Malleable Iron. Joints: Screwed.

**2.03 FLANGES, UNIONS, AND COUPLINGS**

A. Pipe Size 2 inches and Under: 150 psig malleable iron unions for threaded ferrous piping.

B. Pipe Size Over 2 Inches 150 psig forged steel slip-on flanges for ferrous piping.

**2.04 GAS COCKS**

A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.

B. Over 2 Inches: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.

**PART 3 EXECUTION**

**3.01 PREPARATION**

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

**3.02 INSTALLATION**

A. Install piping to conserve building space and not interfere with use of space.

B. Group piping whenever practical at common elevations.

C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Provide clearance for access to valves and fittings.

E. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with the Architect.

F. Establish elevations of buried piping outside the building to ensure not less than two feet of cover.

G. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.

H. Install valves with stems upright or horizontal, not inverted.

I. Provide one plug cock wrench for every ten plug cocks sized 2 inches and smaller, minimum of one. Provide each plug cock sized 2-1/2 inches and larger with a wrench with set screw.

J. Paint all exposed piping as directed by the Architect.

K. Do not install underground gas in same trench as other underground utilities.

L. Do not install valves concealed. All gas valves must be accessible.

**3.03 APPLICATION**

A. Use welded connections for all high pressure gas piping (above 5-ounces), all gas piping over 2" in size, all underground steel piping and for all in-accessible concealed piping.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Paint all exterior exposed gas piping and associated supports with two coats of weatherproof protective paint. Color shall be as directed by the Architect.

D. Provide cathodic protection for all underground steel piping as recommended by the Local Utility Company. Isolate all steel above grade piping from underground steel lines with the use of isolation flanges where piping rises up from below grade.

E. The minimum acceptable gas line size shall be 3/4".

### 3.04 FINAL CONNECTIONS

A. Make final gas connections to all natural gas appliances and fixtures; including owner furnished equipment and equipment furnished by other trades.

B. Make final connection in strict compliance with the manufacturer's recommendations.

C. Provide dirtleg, union and cutoff valve at all gas line connections to gas equipment. The dirtleg union and cutoff valve shall be the size called for on the drawings (not connection size). Provide reducer as required immediately at unit connection.

**END OF SECTION**

# SECTION 23 23 00
# REFRIGERANT PIPING AND SPECIALTIES

## PART 1 GENERAL

### 1.01 REFERENCES

A. ARI 730 - Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers

B. ASHRAE 15 - Safety Code for Mechanical Refrigeration.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

D. ASME B31.5 - Refrigeration Piping.

E. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

### 1.02 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASTM B31.5 unless indicated otherwise.

C. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.

D. Valves
   1. Use service valves on suction and discharge of compressors.
   2. Use gage taps at compressor inlet and outlet.

### 1.03 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturers catalog data including load capacity.

C. Test Reports: Indicate results of leak test.

### 1.04 REGULATORY REQUIREMENTS

A. Conform to ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state regulations.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Deliver and store piping and specialties in shipping containers with labeling in place.

C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

D. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

## PART 2 PRODUCTS

### 2.01 PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

B. Pipe Supports and Anchors:
   1. Conform to ASME B31.5. Refer to Section 23 05 29.

## PART 3 EXECUTION

### 3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment in accordance with the manufacturer's recommendations.

### 3.02 INSTALLATION

A. Install piping and refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and not interfere with use of space.

D. Group piping whenever practical at common elevations and locations. Slope piping 0.40 percent in direction of oil return.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as recommended by the equipment manufacturer. Slope horizontal piping 0.40 percent in direction of flow.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Provide access to concealed valves and fittings.

I. When brazing, all pipe work shall be flooded with low pressure nitrogen above atmospheric pressure to prevent the formation of copper oxides and scale and to prevent moisture from the surrounding air entering the system.

J. Follow ASHRAE 15 procedures and the manufacturer's recommendations for charging and purging of systems and for disposal of refrigerant.

K. Fully charge completed system with refrigerant after testing. Comply with refrigeration equipment manufacturer's recommendations.

L. Contractor shall route refrigerant lines concealed in furred areas of the building (except as noted) between outdoor condensing units and indoor cooling coil sections. Provide supports for all lines (provide copper plated supports for all bare copper piping or otherwise isolate bare copper pipe from steel supports). **Size lines per manufacturer's recommendations.**

M. Piping systems shall be installed so as to be clean, dry and totally leak free.

N. All refrigerant piping shall be installed so as to be accessible.

O. All ACR copper piping shall be protected and shall remain factory sealed until time of installation

### 3.03 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psig for 24 hours with no leakage. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector. Test to no leakage.
   1. All pressure testing of refrigerant piping shall be verified with the owner
   2. All systems shall have owner verified evacuations

C. Submit letter to the Architect confirming refrigeration system test with date and time of each test.

D. Insulate per 23 07 00.

**END OF SECTION**

# SECTION 23 31 13
# METAL DUCTS

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Medium and low pressure metal supply, return, exhaust and outside air ducts.

B. Dust Collection Exhaust Ductwork.

C. Residential Dryer Vents.

D. Duct sealing.

### 1.02 RELATED WORK

A. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

B. Section 23 07 00 - HVAC Insulation.

C. Section 23 33 00 - Air Duct Accessories.

### 1.03 REFERENCES

A. ASHRAE - Handbook 1981 Fundamentals; Chapter 33 - Duct Design.

B. ASHRAE - Handbook 1983 Equipment; Chapter 1 - Duct Construction.

C. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

D. ASTM A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

E. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

F. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.

G. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

H. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

I. SMACNA - HVAC Duct Construction Standards.

J. NFPA 77 – Recommended practice for static electricity.

### 1.04 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A, ASHRAE, International Mechanical Code (IMC) and SMACNA Standards.

### 1.05 SUBMITTALS

A. Submit shop drawings and product data.

B. Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for low pressure and high pressure systems.

C. Provide a hanger and support schedule.

D. Supplier of dust collection duct shall prepare and submit complete system shop drawings showing all duct sizes, fittings, transitions, blast gates and floor sweeps.

### 1.06 QUALITY ASSURANCE

A. SMACNA Duct Construction Manual shall be the minimum requirement for the air distribution system.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site per the manufacturer's recommendations.

B. Store and protect products per the manufacturer's recommendations.

## PART 2 PRODUCTS

### 2.01 MATERIALS (EXCEPT DUST COLLECTOR EXHAUST DUCTWORK)

A. Steel Duct: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having **G90** zinc

coating for each side in conformance with ASTM A90.

B. Fasteners: Rivets, bolts, or sheet metal screws.

C. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.

D. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

**2.02 DUCTWORK (EXCEPT FUME HOOD EXHAUST DUCTWORK)**

A. Fabricate and support all low pressure supply, return, exhaust and fresh air ducts in accordance with SMACNA HVAC Duct Construction Standards and ASHRAE handbooks, except that **all duct joints shall be sealed**. Seal all longitudinal and transverse joints. All exterior exposed ductwork shall be sealed watertight. Horizontal ductwork exposed to the elements shall be sloped to permit rainwater run-off.

B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes.

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.

E. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

F. Use double nuts and lock washers on threaded rod supports.

**2.03 DUST COLLECTION EXHUAST DUCTWORK**

A. Fabricate and construct in accordance with SMACNA duct construction standards. ASHRAE and the manufacturer's recommendations. Duct system shall be specifically designed for dust collection applications.

B. ASTM A527 galvanized steel with G90 rating. Standard construction shall be suitable for +10 inches WG to -30 inches WG systems.

C. Modular quick-connect system equal to United McGill Uni-Quick or Nordfab QF Quick-Fit industrial exhaust duct system.

D. Rolled-bip ends with steel snap-on clamp with Buna-N "O" ring temperature resistant to 250°F.

E. System shall include all reducers, tees, blast gate valves, floor sweeps, etc. as shown on the plans.

F. System shall ensure metal-to-metal contact at all joint connections for maximum duct system conductivity.

G. Short section of flexible rubber hose shall be used at the final connections to shop woodworking equipment. Flexible hoses must have metal grounding helix. Secure to rigid duct and equipment with clamps per the manufacturer's recommendations.

**2.04 RESIDENTIAL DRYER VENTS**

A. Galvanized round duct with smooth interior finish and joints running in the direction of the exhaust airflow. Joint fasteners that protrude into the duct shall not be used. Comply with dryer manufacturer's venting recommendations.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. The design drawings are not intended to be shop drawings. Coordinate all ductwork with the work of all other trades on the project and verify sufficient ceiling space prior to beginning any ductwork fabrication or installation. Immediately notify the Architect of conflicts.

B. Provide openings in ductwork where required to accommodate thermometers, airflow measuring stations, and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

C. Located ducts with sufficient space around equipment to allow normal operating and maintenance activities.

D. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Protect ducts from moisture during construction.

E. Provide turning vanes at all offsets and elbows in rectangular supply, return and exhaust ductwork.

F. For ducts specified to be externally insulated (Refer to Section 23 07 00) ensure all duct joints are sealed prior to installing external insulation wrap.

**3.02 ADJUSTING AND CLEANING**

A. Clean duct system thoroughly to remove all accumulated dust and debris.

**3.03 SEALING**

A. Seal all joints of supply air, return air, fresh air, relief air and exhaust air ducts with duct sealant.

B. Joints in low pressure and high velocity supply air ducts (except "ductmate" systems) shall be sealed with hard cast pressureless tape with FTA-20 adhesive.

C. All exterior exposed ductwork shall be sealed "water-tight" and the tops sloped to prevent rainwater runoff. Provide suitable flashing and counter flashing where ductwork penetrates exterior walls. Caulk/seal full perimeter.

D. All duct joints in dust collection ductwork shall be rigidly clamped per the manufacturer's recommendations.

**3.04 DUCTWORK APPLICATION SCHEDULE**

| AIR SYSTEM | MATERIAL |
|---|---|
| Supply Air | Steel * |
| Return and Relief | Steel * |
| General Exhaust | Steel * |
| Residential Dryer Vents | Galv. Steel |
| Dust Collector Exhaust | G90 Galv. Steel ** |

* - Seal supply air ducts for 3" w.c. pressure class. Seal all return, relief and exhaust ducts for 1" w.c. pressure class.

** - SMACNA Class 3, tested to +/- 30" WG.

**3.05 DUCT HANGER AND SUPPORTS**

A. Provide duct supports and hangers in accordance with SMACNA. Provide seismic restraint complying with SMACNA Seismic Restraint Manual where required by local code. Anchor risers in the center of the vertical run to allow ends of riser free vertical movements. Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing member, provide suitable intermediate metal framing.

B. Support dust collection ductwork per the manufacturer's recommendations.

**END OF SECTION**

# SECTION 23 33 00
# AIR DUCT ACCESSORIES

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Volume control dampers.

B. Fire dampers.

C. Backdraft Dampers.

D. Air Turning Devices.

E. Flexible Duct Connections.

F. Duct Access Doors.

G. Duct Test Holes.

H. Series Fan Powered VAV Terminals with ECM Motors and Electric Heat.

I. Cyclone Dust Collector.

### 1.02 RELATED WORK

A. Section 23 31 13 - Metal Ducts.

### 1.03 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

B. SMACNA - Low Pressure Duct Construction Standards.

C. UL 33 - Heat Responsive Links for Fire-Protection Service.

D. UL 555 - Fire Dampers and Ceiling Dampers.

### 1.04 SUBMITTALS

A. Provide shop drawings for shop fabricated assemblies indicated, including volume control dampers, duct access doors, and duct test holes. Provide product data for hardware used.

B. Submit manufacturer's installation instructions.

## PART 2 PRODUCTS

### 2.01 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.

C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.

D. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.

E. Fabricate multi-bade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.

G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

H. On externally insulated runout ducts mount quadrant regulators on stand-off mounting brackets, bases or adapters **so that the operator completely clears the insulation covering.** Dampers in branch runouts shall be equal to Greenheck Model MBD/MBDR

I. Manual Balancing Dampers installed in areas with "hard" or non-accessible ceilings and in areas with high ceilings or congested ceiling spaces where access to dampers for final balance will be difficult shall be remote powered balancing type with low voltage actuator equal to Greenheck Model RBD-10 (rectangular) or RBDR-60 (round) with EZ Balance hand held 9-volt remote. Dampers shall be wired individually to RJ11 wall plates (multiples as required) secured to the structure and accessible from adjacent spaces with accessible lay-in ceilings or lower accessible ceiling spaces. Furnish all required wiring between the dampers and the accessible plug plates. All wiring and wall jacks shall be concealed. All wiring shall be plenum rated.

**2.02 FIRE DAMPERS**

A. Furnish in accordance with NFPA 90A and UL 555.

B. Furnish curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream.

C. Furnish multiple blade fire dampers with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.

D. Fusible links, UL 33, shall separate at 212 degrees F.

E. Provide 10% extra fusible links.

F. All Dampers shall be U.L. listed.

G. Hinged duct access panels shall be provided at each fire damper location to provide adequate access to the damper for servicing.

H. All damper components shall be by a single manufacturer.

**2.03 BACKDRAFT DAMPERS**

A. Gravity backdraft dampers, size 18 x 18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturer's standard construction.

B. Fabricate multi-blade, parallel action gravity balanced back-draft dampers of 16 gage galvanized steel with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

**2.04 AIR TURNING DEVICES**

A. Multi-blade device with double-thickness airfoil blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

**2.05 FLEXIBLE DUCT CONNECTIONS**

A. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.

B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 36 oz per sq yd, approximately 3 inches wide, crimped into metal edging strip.

C. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

**2.06 DUCT ACCESS DOORS**

A. Fabricate in accordance with SMACNA Duct Construction Standards and as indicated.

B. All duct access doors in rectangular ductwork shall be hinged, dual wall insulated construction. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes. All access doors must be hinged - access doors with sheet metal screw fasteners or cam-locks only are not acceptable.

C. Perimeter gasketing for tight seal.

D. Provide identification stenciling at all duct access doors to identify the fire protection device within in accordance with NFPA 90A. All lettering shall be minimum ½ " tall.

## 2.07 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required to accomplish all airflow testing. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps. Duct tape over holes is NOT acceptable.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation. Provide permanent test holes only where shown on the plans.

## 2.08 FAN POWERED VAV TERMINALS

A. These Specifications set forth the minimum requirements for series fan-powered VAV terminal units. If they comply with these Specifications, series fan-powered VAV terminal units manufactured by one of the following manufacturers will be acceptable:
   1. Nailor Industries.
   2. Titus
   3. EnviroTec

B. Furnish and install series fan-powered VAV terminal units as indicated on the Drawings. The units shall be designed and built as a single unit and provided with a primary variable air volume damper that controls the primary air quantity in response to a temperature control signal. The damper construction shall be rectangular with multiple opposed blades designed to operate on a 45° arc. Blades shall be heavy gauge galvanized steel, single thickness construction with heavy-duty gasket glued to the blades. Units shall be suitable for pressure independent control with electronic DDC controls. The units shall contain a fan and motor assembly and hot water heating coils where scheduled and/or indicated on the Drawings. The fan shall provide a constant volume of discharge air at all air blending ratios from minimum to maximum scheduled primary air quantities and zero to 100% return air flow rates and shall be controlled in sequence as specified in Section 23 09 00. The space limitations shall be reviewed carefully to ensure all terminal units will fit into the space provided including National Electric Code clearances required in front of all panels containing electrical devices. Units shall be of space frame construction with 16 gauge corner posts for structural support and attachment points. Removable access doors or panels of minimum 20 gauge galvanized steel on the top, bottom and both sides of the terminal unit shall provide access to service the fan, electric motor and all internal components. Units shall be fully rated, even with electric or hot water heater coils, to operate in left hand or right hand mode by turning the unit over. Unit shall be fully lined with at least 3/4" thick, dual density fiberglass insulation completely encapsulated between solid outer and inner solid sheetmetal liners. Casing leakage shall not exceed 2% of terminal rated airflow at 0.5" wg. interior casing pressure. All high side casing joints shall be sealed with approved sealant and high side casing leakage shall not exceed 2% of terminal rated airflow at 3" wg.
   1. Provide a filter rack with track for 1" thick disposable filter.
   2. DDC controls for the VAV terminals shall be supplied by the controls contractor. The VAV terminal manufacturer shall mount the DDC controls on each box at the factory. DDC controllers shall be supplied by the controls contractor. All cost for factory mounting the DDC controls shall be the responsibility of the VAV terminal box manufacturer.

C. Terminal unit manufacturer shall provide flow curves for the primary air sensor clearly labeled and permanently attached on the bottom or side of each fan terminal.

D. The unit shall include all equipment and controls as required to provide a complete and operating system with at least the following equipment and controls:
   1. Single point electrical connection for the voltage/phase as scheduled in the Contract Documents. See Electrical Drawings for power feeder arrangements. Motors shall be rated at **208 volts** single phase as scheduled in the contract documents.
   2. A toggle disconnect switch for cooling only units, or a door interlocking disconnect switch for terminal units with electric heating coils. All disconnecting devices shall be sized and located as required to disconnect all ungrounded power conductors to all internal electrical components.
   3. Individual overcurrent protection devices as required to protect individual units and transformers.
   4. The primary inlet shall be equipped with an inlet collar sized to fit the primary duct size shown on

the Drawings. The inlet collar shall provide at least a 6" length with a 1/8" high raised single or double bead located approximately 1-1/2" from the inlet connection. The primary and fan design cfm settings shall be clearly and permanently marked on the bottom of the unit along with the terminal unit identification numbers. Each terminal unit shall incorporate a Nailor Diamond Flow sensor with four pick up points on each side to insure that with typical duct turbulence, the controller fidelity shall be +/-5% of set volume even with a hard 90° elbow at the inlet. Static variation of 0.5" wg. to 6.0" wg. shall not affect the flow reading. Provide a transformer with 24 volt AC secondary to provide power for the unit's controls and the Division 17 controls. The VAV terminal unit manufacturer and the Section 23 09 00 Building Controls Subcontractor shall verify compatibility of the multi-point flow sensors with transducer and DDC microprocessor furnished under 23 09 00 prior to bidding this Project.

5. The outlets shall be rectangular and suitable for flanged duct connections. Space frame casing shall have mounting area for hanging by sheet metal straps from a concrete slab or shall be supplied with angle brackets for mounting on all thread rods.
6. Fan motor assembly shall be a forward curved centrifugal fan with a direct drive motor. Motors shall be General Electric ECM and/or Nailor EPIC variable-speed dc brushless motors specifically designed for use with a single phase, **208** volt, 60 Hertz electrical input. Motor shall be complete with and operated by a single phase integrated controller/inverter that operates the wound stator and senses rotor position to electrically commutate the stator. All motors shall be designed for synchronous rotation. Motor rotor shall be permanent magnet type with near zero rotor losses. Motor shall have built-in soft start and slewed speed change ramps. Motor shall be able to be mounted with shaft in horizontal or vertical orientation. Motor shall be permanently lubricated with ball bearings. Motor shall be direct coupled to the blower. Motor shall maintain a minimum of 65% efficiency over its entire operating range. Provide isolation between fan motor assembly and unit casing in at least 4 locations to eliminate any vibration from the fan to the terminal unit casing. Provide isolation between the motor and blower as well as between the blower and casing. Provide anti-back rotation system or provide a motor that is designed to overcome reverse rotation and not affect life expectancy.
   a. The manufacturer of the fan powered terminal units shall set the fan discharge cfm at the factory. If the fan powered terminal unit manufacturer cannot factory set the fan cfm, he shall send factory technicians to the field to adjust the GE ECM and/or Nailor EPIC motor and the associated controller/inverter to the discharge CFM indicated in the Schedules in the Contract Documents. Fan cfm shall be constant within ± 5% regardless of changes in static upstream or downstream of the terminal unit after it is installed in the field. Fan cfm is to be set with a potentiometer and digital meter. Neither SCR's nor rheostats shall be an acceptable means of setting the fan cfm. The terminal unit manufacturer shall provide one speed adjustment device to the Owner for field adjustment of the fan speed should construction or design changes become necessary.
   b. A witnessed test shall be conducted by the fan powered terminal unit manufacturer in an independent testing laboratory to confirm that the terminal unit and the fan motor as an assembly performs in accordance with this specification. If the fan powered terminal unit and dc motor as an assembly fails to perform as specified and as scheduled on the drawings, the terminal unit manufacturer shall make adjustments and take all corrective action as necessary at the terminal unit manufacturer's sole expense.

E. The terminal unit shall be listed in accordance with UL 1995 as a composite assembly consisting of the terminal unit with or without the electric or hot water heating device.

F. The terminal unit shall be capable of operation as described herein with inlet static pressure of .05 at full cooling with no mixing of induced and primary air. The primary air damper shall be of a design that shall vary primary air supply in response to an electronic signal. Primary air damper close-off leakage shall not exceed 2% of the maximum ARI rated primary air cfm as shown in the manufacturer's catalog for each size terminal unit at 3" w.g. inlet static pressure. Submit damper leakage test data to the Engineer for review. Damper linkage and actuator shall be located inside the terminal unit. Damper connection to the operating shaft shall be a positive mechanical through bolt connection to prevent any slippage. Provide non-lubricated Delrin or bronze oilite bearings for the damper shaft.

The primary air damper in conjunction with the DDC microprocessor shall be selected to provide accurate control at low primary air velocities. The total deviation in primary airflow shall not exceed ± 5% of the primary air cfm corresponding to a 300 fpm air velocity through the primary air damper.

G. Provide a mixing chamber to provide mixing of primary air and plenum air from 100% primary air to 0% primary air. Mixing of the primary and secondary air streams shall be as described in paragraph

H. The deviation of fan supply air at design conditions and primary air flow rates from 100% primary air to 0% primary air shall not exceed 5%.

I. Provide duct inlet and outlet connections as indicated on the Drawings.

J. A double wall galvanized sheet metal housing shall be provided for the terminal unit casing. The casing construction shall be a minimum 20 gauge outer sheet with a minimum 22 gauge perforated or 26 gauge solid inner sheet encapsulating minimum 3/4" thick, dual density, minimum 1-1/2 lb. density fiberglass insulation. The terminal units utilizing 22 gauge perforated inner sheets shall have reinforced foil faced fiberglass insulation. Mounting connections for hanging the unit by sheet metal straps shall be clearly identified on the housing. All components, including all controls and wiring, shall be factory installed, except the room sensor or thermostat. No field assembly will be allowed. The unit shall be complete and suitable to accept the following field connections:
   1. Primary duct.
   2. Secondary duct.
   3. Single point electrical connection. See Drawings for control box locations required for each terminal unit.
   4. DDC controller control signals and wiring.
   5. Room sensor connection.

K. The terminal unit shall be capable of operating throughout the full cataloged primary airflow range with an inlet static pressure of 0.10" w.g. or less.. All downstream static pressure requirements are to be supplied by the terminal unit internal fan. See the schedules on the Contract Documents for static pressure requirements.

L. The control sequence shall be as specified in Section 23 09 00.

M. Each size of each terminal unit to be used on this Project shall be completely laboratory tested for air performance and acoustics. The acceptability of the independent testing laboratory is subject to review by the Owner, Project Acoustical Consultant, and the Engineer. The terminal unit manufacturer shall submit complete details, brochures, instrumentation information, etc., for review.

N. All fan powered terminal units shall be identified on the bottom of the unit (minimum 1/2" high letters) and on the shipping carton, with the floor and box number that identifies it along with the CFM settings. Every unit shall have a unique number combination that matches numbers on the contractor's coordination drawings as to its location and capacity and is coordinated with the DDC controller and Section 23 09 00 Building Control System submittal drawings.

O. The FPTU manufacturer will verify the operation of each fan powered terminal before shipment. Testing shall include at least the following:
   1. Apply electric power to the unit.
   2. Start the fan and verify fan rotates properly.
   3. The FPTU manufacturer shall factory or field adjust the GE ECM and/or Nailor EPIC motor and associated controller/inverter to the discharge CFM indicated in the Schedules
   4. If DDC controls are mounted, disconnect the primary air damper actuator from the DDC terminal unit controller. Provide separate power source to the actuator to verify operation and rotation of damper. Drive the damper closed and verify by feel or observation that damper is driven fully closed. Return primary air damper to the fully open position prior to shipment.
   5. Provide a written inspection report for each terminal unit signed and dated by the factory test technician verifying all terminal unit wiring and testing has been performed per the manufacturer's testing and quality assurance requirements.

P. Heating coils shall be electric resistance with fully modulating SCR Controls. Heaters shall be rated for 208-volt three phase electrical as scheduled on the drawings.

## 2.09 CYCLONE DUST COLLECTOR WITH MOTORIZED SHAKER AFTER FILTER

A. Furnish and install, where shown on the plans, a high efficiency cyclone with integral blower sized for design airflow (as shown on the schedule) of 3,350 CFM @ 9" ESP W.G.

B. Design
   1. Cyclone body shall be made of 14gauge steel and welded construction. Unit complete with internal helix to improve dust separation and decrease internal pressure drop.
   2. A drum assembly shall be included, which consists of 55 gallon steel drum, drum cover with flexible connection to cyclone, stainless steel hose clamps and support legs. A hinged explosion relief door shall be provided in the cylinder section of the cyclone.
   3. Cyclone dust collector shall be supplied with a motorized shaker after filter to re-circulate the filtered air. Due to the wood working machine types present, shaker baghouse type collector is unacceptable.

C. Blower
   1. The integral blower shall be factory mounted on the clean air side and be of the radial design with a dynamically balanced aluminum impeller. It shall be direct driven by a 460/3/60, 10 HP, 3450 RPM TEFC motor.

D. Finish
   1. Interior and exterior carbon steel surfaces shall be coated with two part epoxy primer and exterior painted with gray two part urethane enamel.

E. Dust collector shall be model CDC30-10-3 as supplied by Ventaire.

F. Outdoor After Filter
   1. After filter shall be enclosed style, suitable for outdoor installation. Filter media shall be 8 oz. cotton sateen, consisting of (39) 5" dia. x 90" long filter bags with a total filter area of not less than 373 sq.ft. Filters shall be cleaned by the motorized shaker and controller, which includes a magnetic starter and dual delay timer. Dust shall be stored in dust chamber. Pressure drop, with clean filters, will be approximately 0.5" W.G.

G. OPTION #2: ICE CAP
   1. For outdoor installation, ice cap shall be provided to protect TEFC motor from icing conditions.

H. OPTION #3 SOUND ATTENUATION
   1. A duct silencer, lined with 4.75-lb. density inorganic mineral or glass fiber, shall attenuate discharge from the blower. The media shall be protected from erosion by airflow through the use of galvanized, perforated metal with aerodynamic leading and trailing edges to insure maximum acoustical insertion loss at minimum static pressure drop. Must comply with ASTM E84 for flame retardancy and comb.

I. Provide manufacturer's start-up services after installation is complete to confirm proper operation.

# PART 3 EXECUTION

## 3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. Drop and reset all fire dampers as an integral part of the installation to ensure proper operation after installed. Reset dampers using the duct and/or ceiling access doors provided to ensure the service access is adequate as installed. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative if requested.

C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide fire dampers where indicated on the plans. All fire dampers shall be installed in accordance with the manufacturer's written installation instructions and SMACNA. Contractor shall also drop and reset each damper after installation. All resetting shall be done thru the duct access doors provided so as to verify that each access door is adequately sized/positioned. Provide SMACNA approved breakaway connections at each fire damper. Brace ducts on both sides of fire damper as necessary to prevent movement of the duct.

E. Interrupt ductliner, at all fire dampers. Seal ductliner edges. Protect ductliner edges facing the air stream with metal nosing.

F. Provide ductwrap insulation at all fire damper frames.

G. Support VAV terminals from structure. Provide seismic cable bracing for each series flow terminal box.

H. Do not operate fan powered terminals during the construction phase without the proper filtration on the plenum air inlet of the box. Temporary filtration media shall be MERV 8 minimum. Replace all filters used during the construction phase with new, clean, properly sized disposable filters immediately prior to owner's occupancy of the building.

I. Install dust collector per the manufacturer's instructions. Factory authorized technicians shall provide initial system start-up and confirm proper operation. Provide 2-hours training on operating and maintenance procedures for the system.

**END OF SECTION**

# SECTION 23 37 13
# DIFFUSERS, REGISTERS AND GRILLES

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Diffusers, Registers, Grilles and Louvers for HVAC

### 1.02 RELATED WORK

A. Section 23 31 13 - Metal Ducts.

B. Section 23 33 00 - Air Duct Accessories

### 1.03 REFERENCES

A. ADC 1062 - Certification, Rating and Test Manual.

B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.

C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

D. ARI 650 - Air Outlets and Inlets

E. ASHRAE 70 - Method of Testing for Rating the Airflow Performance of Outlets and Inlets.

F. SMACNA - Low Pressure Duct Construction Standard.

### 1.04 QUALITY ASSURANCE

A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

B. Test and rate performance of louvers in accordance with AMCA 500.

### 1.05 REGULATORY REQUIREMENTS

A. Conform to ANSI/NFPA 90A.

### 1.06 SUBMITTALS

A. Submit product data under provisions of Section 013000.

B. Submit schedule of outlets and inlets indicating type, size, location, application and noise level at operating conditions.

C. Review requirements of outlets and inlets as to size, finish and type of mounting prior to submitting product data.

D. Submit manufacturer's installation instructions.

## PART 2 PRODUCTS

### 2.01 DIFFUSERS, REGISTERS AND GRILLES

A. Devices shall be of the type, size and manufacture as scheduled on the drawings.

## PART 3 EXECUTION

### 3.01 INSTALLATION

A. Install items in accordance with the manufacturer's instructions.

B. Check location of outlets and inlets to make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.

C. Install all diffusers, registers and grilles to ductwork with an air tight connection.

D. Frame styles for all ceiling mounted devices shall match the type of ceiling where shown to be installed.

E. Finish colors of all devices shall be as directed by the Architect.

F. Paint all visible duct and/or mechanical liner fastener heads inside diffusers and registers matte black.

G. Unless otherwise notes, all louvers shall be supplied with factory applied baked-on finish in the finish color selected by the architect. Provide color samples to the Architect with product submittal data.

**END OF SECTION**

# SECTTION 23 73 33
# FUEL FIRED HEATING EQUIPMENT

## PART 1 GENERAL

### 1.01 SECTION INCLUDES

A. Sealed Combustion Unit Heaters and Accessories

B. Gas Infra-Red Tube Heaters

### 1.02 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.

B. American Gas Association (AGA).

### 1.03 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 33 00

B. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

### 1.04 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 01 78 00.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

### 1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Section 01 51 00.

B. Store and protect products under provisions of Section 01 51 00.

C. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

## PART 2 PRODUCTS

### 2.01 GAS FIRED UNIT HEATERS

A. Provide high-efficiency, separated-combustion, power vented, gas-fired unit heaters manufactured as Reznor brand units. The units shall be designed for use in building areas with negative pressure and /or where there is a safety, security, or application need to completely seal the combustion circuit.

B. The heater shall be equipped with a multi-cell, 4 pass serpentine style steel heat exchanger. Heat exchange tubes shall be pressure fabricated of 409 stainless steel. All heat exchangers shall be with no welding or brazing, only tool pressed mechanical joints. All heat exchanger cells shall be designed with an aerodynamic cross section to provide maximum airflow.

C. The units shall incorporate a single, one piece burner assembly with a single orifice. The burner shall have a continuous would close pressed stainless steel ribbon separating the flame from the burner interior. All units shall have a single venturi tube and orifice supplying fuel to a one-piece burner housing. Each heat exchanger cell shall use balanced draft induction to maintain optimum flame control.

D. Controls shall include a single stage gas valve; direct spark multi-try ignition with electronic flame supervision with 100% lockout integrally controlled via a printed circuit control board. The control board shall also incorporate diagnostic lights, DIP switches for fan overrun settings, and a relay for fan only operation. All units shall be equipped with a safety limit switch. All controls shall be enclosed in the sealed control compartment to protect them from accidental damage, dust and atmospheric corrosion.

E. The unit shall have a factory installed power venter device to draw combustion air from outside the building. The outside air shall enter the unit through a factory installed round inlet air terminal on the rear of the heater. The control compartment shall be sealed and the access door shall be gasketed to prevent dirt, lint, dust, or other contaminants present in the heated space from entering the unit. The control compartment door shall be equipped with a safety interlock switch to prevent operation when the door is open. The combustion air supply pipe and flue exhaust pipe shall be run in parallel from the

heater to a factory supplied concentric adapter assembly, which allows for a single wall or roof penetration. The combustion air/venting system shall include a vibration isolated power vent motor and wheel assembly and a combustion air pressure switch. Unit sizes 30-125 shall include a flame rollout switch.

F. Operation shall be controlled by an integrated circuit board that included LED diagnostic indicator lights. Supply voltage connections shall be made in a sealed junction box. 24-volt control connections shall be made on a n externally mounted terminal strip. All internal wiring, both line and control voltages, shall be terminated by insulated terminal connectors to minimize shock hazard during service.

G. All units will be equipped with a built-in disconnect switch.

H. The unit shall be designed with a full opening service access panel complete with screw closure attachment and lifting handle for removal. Service panel shall be fully gasketed and equipped with a safety inter-lock switch. All components in the gas train, all standard electrical controls, and the power venter shall be within the sealed service compartment.

**2.02 GAS INFRA-RED TUBE HEATERS**

A. Gas-fired radiant tube heaters shall be SOLARONICS SUNTUBE IV VERSAMOUNT SERIES of the model numbers and inputs in MBTUH as manufactured by Solaronics, Inc. Rochester, Michigan 48307.

B. Gas-fired radiant tube heaters shall be designed to satisfactorily operate at a minimum inlet pressure of: 6 inches W.C. for 40-125 MBTUH units, and 7 inches W.C. for 130-200 MBTUH units, when specified for natural gas.

C. Gas-fired radiant tube heaters shall be designed to operate without adjustments when burning natural gas having a heat value of 1000 BTU per cubic foot with a specific gravity of .65.

D. CONSTRUCTION

The heater's controls shall be totally enclosed with a corrosion resistant housing. The controls shall be easily accessible from three sides by removing the cover. The burner core assembly shall be constructed of durable materials specially designed for high efficiency, maximum heat transfer, extremely quiet operation and extended life.

E. The heater's combustion chamber shall be 4" O.D. Aluminized 409 stainless steel or Aluma Therm finished with a high emissivity rated, corrosion resistant, black coating (105-200 MBTUH).

F. The heater's heat exchanger tube shall be heavy-duty 12 ga. (.109") wall thickness 4" O.D. black steel.

G. The heaters are CSA Design Certified for alternate construction utilizing radiant tubes of all Aluma Therm finished with a high emissivity rated, corrosion resistant, black coating.

H. The 4" O.D. tubes shall be joined by two layers of 18 ga. (.052") wall thickness aluminized steel tube clamp assembly and shall be a minimum of 8" in length for maximum support. Clamp shall be of a compression coupling design for uniform draw and pressure.

I. The direct spark ignitor shall be durable to resist breakage.

J. Reflectors shall be .025" thick - #3003H25 aluminum mill finish with a geometrically designed configuration not having less than 91.7% reflectional efficiency, shall be held by a .229" diameter nickel plated steel wire hanger. Hanger shall incorporate the geometric ability to rotate the reflector to 0 or 30 degrees, in either direction from horizontal using the center of the combustion chamber or heat exchanger as the axis of rotation.

K. Each 5 or 10-foot reflector section shall have the ability to be independently rotated from all other 5 or 10-foot sections, or overlapped between 5 or 10-foot sections, or a combination of both over the entire length of the system. The heater's reflector hanging system shall be designed to permit expansion while minimizing noise and/or rattles. Reflectors shall be assembled to the heater without the use of tools.

L. Heaters shall utilize a downstream turbulator that shall be factory installed in the last 10-foot heat exchanger section, wave formed for optimal turbulation, acceleration and impingement of the products of combustion resulting in appropriate velocity pressure and momentum for maximum thermal efficiency.

M. Heaters shall be equipped with a sight glass permitting a visual inspection of the spark ignitor and burner operation from the floor.

N. Tube heaters shall be designed such that outside combustion air may be supplied without the use of additional supply fans.

O. Heaters shall be directly vented outdoors with insulated flue pipe.

P. Heaters shall come with a 36" long stainless steel flexible gas connector.

Q. CONTROLS
1. Heater controls shall be isolated from combustion air to prevent corrosion from wet or dirty air.
2. Heaters shall be equipped with a direct spark ignition system with three (3) trials-for-ignition and upon loss of flame sensing three (3) re-trials for-ignition. Flame sensing shall be via an independent sensing rod and circuit.
3. Power supplied to each burner shall be 120 VAC, 60 Hz. Maximum heater electrical current draw shall not exceed 3 amps.
4. Heater controls shall include a safety differential pressure switch, factory set (non-field adjustable), to monitor combustion airflow, so as to provide complete burner shutdown due to insufficient combustion air or flue blockage.
5. The heater's control system shall be designed to shut off the gas flow to the burner in the event either a gas supply or power supply interruption occurs.
6. Combination gas control shall have a step open feature for softer ignition. Gas valve shut-off shall be of the redundant type. 100% safety shut-off.
7. The heater shall have an 1/8" – 27 FPT externally accessible inlet gas pressure test point.
8. The heater shall automatically recycle itself after an inadvertent shutdown.
9. The heater shall have three (3) system validation lights easily visible on the bottom of the burner housing. Lights shall validate "Power On," "Air Pressure Normal," and "Operation Normal."
10. The heater's blower motor shall be thermally protected, permanently lubricated and the blower motor's impeller shall be both statically and dynamically balanced.
11. The heater's airflow control system shall provide a pre-purge prior to initiating burner operation.
12. No condensation shall form as a result of combustion in the combustion chamber or heat exchanger tubes while at operating temperatures.
13. Total heater shutdown shall occur in the event of circuit control lockout, including burner operation and combustion air blower. An interruption of power (reset thermostat) will restart the firing sequence.

## 2.03 DIRECT FIRED MAKE-UP AIR UNITS

A. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
1. Greenheck Fan Corporation

B. Units with Integral Heating shall be fully assembled at the the factory and consist of an insulated metal cabinet, a curb assmembly, a motorized intake damper, supply air blower assembly, electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

C. CABINET
1. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
a. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvanized steel. Base rail is 12 gauge, galvazined (G90) steel.
b. Internal Assemblies: 24 gauge galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
2. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

a. Materials: Fiberglass insulation. If insulation other than fiberglass is used. it must also meet the Fire Hazard Classification shown below.
   1) Thickness: 1 inch (25 mm)
   2) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
   3) Location and application: Floor of each unit shall be insulated with fiberglass insulation. Full interior coverage from "Heating on".
   4) Access panels: Unit shall be equipped with insulated removable access panels to provide easy access to all major components. Access panels shall be fabricated of 18 gauge steel. Removable access panels shall incorporate a formed drip edge.
   5) Supply Air blower assembly options:
      a) Direct-drive fan(s): Blower assembly shall consist of an electric motor as specified by A/E. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on minimum 1.125 inch thick neoprene vibration isolators.

3. Control center / connections:
   a. Unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.
4. Direct Gas-Fired Furnace:
   a. Unit shall be factory assembled, piped, and wired. Direct gas-fired system will be 92% efficient while supplying a burner that is capable of providing 25:1 turndown. Unit will utilize a draw through design and incorporate adjustable burner baffles plates for field adjustments. Unit will have a DirectSpark ignition system.
   b. Burner construction shall consist of a cast aluminum burner manifold and 400 series stainless steel mixing plates. No air from inside the space shall be allowed to pass across the burner at any time. Flame sensing shall be provided by a flame rod. Burner control shall have a digital coded fault indicator capable of storing the last five faults.
   c. Shall be equipped for operation on Natural gas with a maximum rated inlet gas pressure of 1/2 PSI.
   d. Burner control option to include the following: Discharge temperature.
   e. Shall include the following safety controls:
      1) Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.
      2) Dual safety shutoff valves shall be provided that do not exceed 120 VAC control signals.
5. Motorized Inlet Air Dampers: to be of low leakage type and shall be factory installed.
6. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E.
7. Roof curbs for make-up air units to be furnished and installed by the metal building contractor, refer to the roof plan.

D. BLOWER-DD

1. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower and must have neoprene vibration isolation devices, minimum of 1-1/8 inches thick.
2. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".
3. Proceed with installation only after all unsatisfactory conditions have been corrected.

E. MOTORS

1. General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP

and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase, and enclosure.

2. Motors shall be 60 cycle, 1 phase, 115 volt.

F. FILTERS

1. Unit shall have 2" thick permanent metal filters following the outdoor air intake in a V-bank arrangement and shall be accessible from the exterior of the unit.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings. Verify all building openings are correctly positioned.

B. Verify that required utilities are available, in proper location, and ready for use. Verify gas lines are properly regulated.

### 3.02 INSTALLATION

A. Install heaters in accordance with the manufacturer's recommendations

B. Protect units with protective covers during balance of construction.

C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by the manufacturer.

D. Wire and vent units per the manufacturer's installation instructions. Vent unit heaters thru roof to weatherproof concentric vent per manufacturer's recommendations.

E. Seismically brace suspended unit heaters. Refer to section 23 05 48.

F. Support infra-red heater burners and tube/reflector assembly from structure per the manufacturer's recommendations.

G. All air for combustion for the infra-red tube heaters shall be piped individually to each burner directly from outdoors. The units shall not use room air for combustion.

### 3.03 ROOF MOUNTED MAKE-UP AIR UNITS

A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

B. Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage. Refer to Section 23 05 93 "Testing, Adjusting and Balancing" and comply with provisions therein.

C. Verify all sequences of operation per Section 23 09 00 and as noted on the drawings.

D. Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire Make-Up Air unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

**END OF SECTION**

# SECTION 23 74 13
# PACKAGED AIR CONDITIONING UNITS

## PART 1 GENERAL

### 1.01 WORK INCLUDED

A. Section Includes:
   1. Packaged 100% Outside Air Neutral Air Ventilators with Integral Heat Recovery.
   2. Packaged 15 SEER Trane Units with Natural Gas Heat and Hot Gas Reheat (de-humidification).
   3. Packaged Greenheck Units with Natural Gas Heat and Hot Gas Reheat (de-humidification).

### 1.02 REFERENCES

A. Air-Conditioning and Refrigeration Institute:
   1. ARI 340/360 - Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
   1. ASHRAE 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter.

C. National Fire Protection Association:
   1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

### 1.03 SUBMITTALS

A. Product Data: Submit data indicating:
   1. Cooling capacities (at scheduled conditions).
   2. Dimensions.
   3. Weights.
   4. Rough-in connections and connection requirements.
   5. Duct connections.
   6. Electrical requirements with electrical characteristics and connection requirements.
   7. Controls.
   8. Accessories.

Manufacturer's Certificate: Certify products meet or exceed specified requirements.

Manufacturer's Field Reports: Submit start-up report.

### 1.04 QUALITY ASSURANCE

A. Cooling Capacity: Rate in accordance with ARI 360.

B. Sound Rating: Measure in accordance with ARI 270.

C. Insulation and adhesives: Meet requirements of NFPA 90A.

### 1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept units on site. Inspect for damage.

B. Protect units from damage by storing off roof until roof mounting supports are in place.

### 1.06 COORDINATION

A. Coordinate installation of units with roof structure, roof deck and roof membrane installation. Position units so that duct openings do not conflict with roof framing.

### 1.07 WARRANTY

A. Furnish five-year manufacturer's warranty for compressors; one year parts and labor and additional 4-year parts-only warranty.

B. Furnish ten-year manufacturer's warranty for stainless steel heat exchangers (units with gas heat); one year parts and labor and additional 9-year parts-only warranty

### 1.08 EXTRA MATERIALS

A. Furnish one extra sets of fan belts for each unit.

B. Furnish three sets of disposable filters for each unit.

## PART 2 PRODUCTS

### 2.01 PACKAGED NEUTRAL AIR VENTILATORS

A. QUALITY ASSURANCE
1. Source Limitations: Obtain unit with all appurtenant components or accessories from a single manufacturer.
2. For the actual fabrication, installation, and testing of work under this section, use only thoroughly trained and experienced workers completely familiar with the items required and with the manufacturer's current recommended methods of installation.
3. Product Options: Drawings must indicate size, profiles and dimensional requirements of Energy Recovery Unit and are to be based on the specific system indicated. Refer to Division 1 Section "Product Requirements".
4. Certifications
   a. Blowers shall be AMCA Certified for air flow.
   b. Entire unit shall be ETL Certified per U.L. 1995 and bear an ETL sticker.
   c. Energy Wheel shall be AHRI Certified, per Standard 1060].
   d. Coils shall be Recognized Components for ANSI/UL 1995, CAN / CSA C22.2 No 236.05. DX and water coils shall be AHRI Certified per standard 410-2001.
   e. Indirect gas-fired furnace shall be ETL certified as a component of the unit.

B. COORDINATION
1. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.

C. MANUFACTURERS
1. Available Manufacturers: Subject to compliance with specifications contained within this document, manufacturers offering products that may be incorporated into the work include, but are not limited to:
   a. Greenheck Fan Corporation.
   b. Valent.
   c. Aaon.

D. MANUFACTURED UNITS
1. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake with metal mesh filter assembly, exhaust air blower, evaporator coil, condensate drain pan, energy wheel, hot gas reheat coil, electric post-heater, packaged DX system, phase and brownout protection, motorized dampers, sensors, curb assembly, filter assembly for intake air, supply air blower assembly, exhaust/relief blower assembly, electrical control center and remote (space mounted) controller panel. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

E. CABINET
1. Materials: Formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
   a. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvanized steel.
   b. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum14 gauge galvanized (G90) steel.
2. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
   a. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
      1) Thickness: 2 inch
      2) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
3. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.

4. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.
5. Exhaust Air blower: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.
6. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.
7. Control panel / connections: Rooftop Ventilator units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch. Electric heater shall have a separate electrical control center and separate high voltage power circuit.
8. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless steel sheet material and provided with a welded stainless steel drain connection at the front for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
9. Energy wheel: Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt with a five year warranty. The wheel media shall be a polymer film matrix in a stainless steel framework and be comprised of individual segments that are removable for servicing. Non-segmented energy wheels are not acceptable. Silica gel desiccant shall be permanently bonded to the polymer film and is designed and constructed to permit cleaning and servicing. The energy wheel is to have a five year warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.
10. Reheat Coil with factory installed modulating hot gas reheat valve.
11. Electric Post-heater: Post-heater shall be SCR control and shall include a temperature sensor with field adjustable set point, located in the outdoor air stream. Heat output of the post-heater shall be infinitely variable.
12. Packaged DX System: unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Condenser fan motors shall be three phase, type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be digital, hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.
13. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
    a. Global alarm condition (active when there is at least one alarm)
    b. Supply Air Proving alarm
    c. Dirty Filter Alarm
    d. Compressor Trip alarm
    e. Compressor Locked Out alarm

f. Supply Air Temperature Low Limit alarm
   1) Sensor #1 Out of Range (outside air temperature)
   2) Sensor #2 Out of Range (supply air temperature)
   3) Sensor #3 Out of Range (cold coil leaving air temperature)]

14. Phase and brownout protection: Unit shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.
15. Motorized Dampers (Intake Air and Exhaust Air): Motorized damper of low leakage type shall be factory installed.
16. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified.

F. BLOWER
1. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.
2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
3. Fan: Airfoil plenum fan statically and dynamically balanced, AMCA certified for air and sound performance, mounted on ground and polished steel fan shafts with ball bearing pillow blocks. Bearings shall be selected for a minimum L10 life in excess of 50,000 hours at maximum catalogued speeds.
4. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

G. MOTORS
1. General: Blower motors greater than ¾ horsepower shall be "NEMA Premium™" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined cast-type, keyed and fully secured to the fan wheel and motor shafts. Electric motors of ten horsepower or less shall be supplied with an adjustable drive pulley.

H. CONTROLS
1. Units shall include factory supplied, mounted, wired, and tested stand-alone microprocessor controls.
2. Microprocessor controller shall be factory-programmed for discharge air control and use an internal 7-day time clock.
3. Microprocessor controller shall be mounted in a weather-proof enclosure and accessible without exposing the operator to high voltage wiring or having to turn off or circumvent the main disconnect.
4. Microprocessor controller shall include local liquid crystal display (LCD) for user interface.
5. The following sensors shall be factory supplied, mounted, and wired inside the unit:
   a. Outdoor air humidity sensor.
   b. Outdoor air temperature sensor.
   c. Evaporator coil leaving air temperature sensor.
   d. Filter pressure monitoring.
   e. Energy wheel rotation sensor.
6. The following devices shall be factory supplied but ship loose and require field installation and wiring:
   a. Supply air temp temperature sensor.
   b. Duct static pressure sensor.
   c. Remote Control Panel for mounting in the occupied space (see plans) for user interface (same as at the unit) without going onto the roof. One panel per unit.

7. Unit shall be supplied with BACnet interface for integration with the Building Automation System specified for this addition, refer to Section 23 09 00. Interface shall permit BAS to monitor and display operating parameters for each unit.

I. FILTERS
1. Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the intake air stream and exhaust air stream.

J. FIELD QUALITY CONTROL
1. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to Architect in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

K. ROOF CURB
1. Support units on full perimeter seismic spring curb with gypsum board acoustical treatments. Mason RSC-A, 24" tall.

## 2.02 PACKAGED 15 SEER UNITS (3-10 TONS) WITH GAS HEAT AND HOT GAS REHEAT

A. Units shall be convertible airflow. Units shall meet ASHRAE 90.1 minimum efficiency requirements. Operating range shall be between 115°F and 0°F cooling as standard from the factory. Cooling performance shall be rated in accordance with DOE and/or ARI testing procedures. All units shall be factory assembled, internally wired, fully charged with R-410A refrigerant and 100 percent run-tested before leaving the factory. Wiring internal to the unit shall be colored and numbered for simplified identification. Units shall be UL listed and labeled, classified in accordance to UL 1995/CAN/CSA No. 236-M90 for central cooling air conditioners. Trane *Precedent* or approved equal.

B. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 1000 hours in a salt spray test in compliance with ASTM B117. Cabinet construction shall allow for all maintenance on one side of the unit. Service panels shall have lifting handles and be removed and reinstalled by removing only a single fastener while providing a water and air tight seal. All exposed vertical panels and top covers in the indoor air section shall be insulated with a cleanable foil faced, fire-retardant permanent, odorless glass fiber material. The base of the unit shall be insulated with ½ inch, 1 pound density foil-faced, closed-cell material. All insulation edges shall be either captured or sealed. The base of the unit shall have provisions for forklift and crane lifting.

C. The top cover shall be one piece construction or where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and prevents water from pooling on unit top.

D. Two inch, throwaway filters shall be standard on all units.

E. Compressors
1. Units shall have direct-drive, hermetic, scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range or plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors. Anti short-cycle timers shall be provided for each unit to prevent compressor short cycling.

F. Refrigerant Circuits
1. Each refrigerant circuit offers a choice of independent fixed orifice expansion device or thermal expansion valve. Service pressure ports, and refrigerant line filter driers shall be factory-installed as standard. An area shall be provided for replacement suction line driers.

G. Evaporator and condenser coils shall be internally finned, 5/16" copper tubes mechanically bonded to a configured aluminum plate fin. Coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil and condenser coil shall be leak tested to 200 psig and pressure tested to 450 psig. The condensate coil shall have a patent pending 1 +1+1 hybrid design with slight gaps for ease of cleaning. A removable, reversible, double-sloped condensate drain pan is standard. Provision for through the base condensate drain is standard.

H. The outdoor fans shall be direct-five, statically and dynamically balanced, draw-through in the vertical discharge position. The fan motor shall be permanently lubricated and shall have built-in thermal overload protection.

I. All 3-5 ton 3-phase units offer a choice of direct-drive, FC, centrifugal fans or belt driven, FC centrifugal fans with adjustable motor sheaves. 3-5 ton direct drive oversized motors shall be available for high static operations. All motors shall be thermally protected. All indoor fan motors meet the US Energy Policy Act of 1992 (EPACT). Supply fan motors shall be selected to meet the airflow and external static pressure requirements scheduled on the drawings.

J. Unit shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Units shall provide an external location for mounting a fused disconnect device.

K. Motorized Outside Air Dampers – Factory installed motorized outdoor air dampers shall open to a set minimum position when indoor fan starts. The damper shall close to the full closed position when indoor fan shuts down.

L. Oversized Motors - Factory or field-installed direct drive oversized motors shall be available for high static applications as scheduled.

M. High Pressure Cutout - This factory-installed option shall be supplied for units that do not have High Pressure cutout as standard. All 3-phase models with scroll compressors include High Pressure Cutout as standard.

N. Roof Curb - The 18" tall roof curb shall be designed to mate with the unit and provide support and compete weather-tight installation when properly installed. Curb shall ship knocked down for field assembly, and include wood nailer strips and provisions for field installed rigid insulation. Curb shall be sloped to match the roof slope and the curb must elevate the units a minimum of 12" above the finished surface of the roof after installation - No exceptions. Roof curbs for units shown to be installed on portions of the roof that are standing seam metal roof shall be furnished and installed by the metal building contractor. Refer to roof plan.

O. Stainless Steel Heat Exchanger - The heating section shall have a progressive tubular heat exchanger design using stainless steel burners and heat exchanger constructed of 409 stainless steel. An inducted draft combustion blower shall be used to pull the combustion products through the firing tubes. The heater shall use a direct spark ignition (DSI) system.

P. Units shall be supplied with hot gas reheat coil for space de-humidification cycle where noted on the equipment schedules. De-humidification cycle (forced cooling with hot gas reheat to neutral supply temperature) shall operate as an independent control sequence based off the relative humidity sensed in the space and shall not require a call for cooling to initiate / operate.

Q. Phase Monitor - Phase monitor shall provide 100% protection for motors and compressors against problems caused by phase loss, phase imbalance, and phase reversal. Phase monitor shall come factory installed and shall be capable of an automatic reset from a fault condition without manual adjustment.

**2.03 GREENHECK UNITS RTU-24 (MULTIPURPOSE ROOM) and RTU-35/RTU-36 (Composites Lab)**

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, exhaust air blower, evaporator coil, hot gas reheat coil, indirect gas-fired furnace, packaged DX system, phase and brownout protection, motorized dampers, motorized recirculating damper, curb assembly, filter assembly intake air, supply air blower assembly, exhaust/relief blower assembly, filter assembly for exhaust air, and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat which has dual point power.

B. Unit cabinet shall be formed, double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
   1. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvaneal steel. Components that receive a painted finish per A / E specification shall be painted with a polyester urethane powder coat.
   2. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.

C. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
   1. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
      a. Thickness: 2 inch (50 mm)
      b. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.

D. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18 gauge galvanized G90 steel or painted galvannealed steel.

E. Supply Air blower assemblies: Blower assembly shall consist of an electric motor and direct-drive fans. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motors shall be capable of continuous speed modulation and controlled by a VFD.

F. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125 inch thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.

G. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a galvanized steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of "interlaced" configuration, permitting independent operation of either compressor without conflict with the other compressor.

H. Control panel / connections: Units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.

I. Reheat coil with factory installed modulating hot gas reheat valve.

J. Indirect gas furnace
   1. Shall be ETL Certified as a component of the unit.
   2. Shall have an integral combustion gas blower.
   3. Shall be ETL Certified for installation downstream of a cooling coil.
   4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
   5. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest plate by means of swaged assembly, welded connections are not acceptable. Heat exchanger tubes shall be supported by a minimum of two fabricated assemblies that support the tubes and also permit expansion and contraction of the tubes.
   6. Heat exchanger shall have a one year warranty.
   7. Furnace control shall be 4:1 Modulating.
   8. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal lift-off door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly and exhaust blower.
   9. Shall have solid state controls permitting stand-alone operation or control by building controllers.

K. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Condenser fan motors shall be three phase, type 56 frame, Open Air Over and Shaft Up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be digital hermetic scroll-type and shall be equipped with liquid line filter drier, thermostatic expansion valves (TXV)(s), manual reset high pressure and low pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant. Each compressor shall be factory-equipped with an electric crankcase heater to boil off liquid refrigerant from the oil.

L. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
   1. Global alarm condition (active when there is at least one alarm)
   2. Supply Air Proving alarm
   3. Dirty Filter Alarm
   4. Compressor Trip alarm
   5. Compressor Locked Out alarm
   6. Supply Air Temperature Low Limit alarm
      a. Sensor #1 Out of Range (outside air temperature)
      b. Sensor #2 Out of Range (supply air temperature)
      c. Sensor #3 Out of Range (cold coil leaving air temperature)
   7. Unit shall be supplied with BACnet interface for integration with the Building Automation System specified for this addition, refer to Section 23 09 00. Interface shall permit BAS to monitor and display operating parameters for each unit.

M. Phase and brownout protection: Unit shall have a factory-installed phase monitor to detect electric supply phase loss and voltage brown-out conditions. Upon detection of a fault, the monitor shall disconnect supply voltage to all motors.

N. Motorized dampers / Intake Air, Motorized dampers of low leakage type shall be factory installed.

O. Motorized Recirculating Air Damper designed to permit 100% recirculation of exhaust air shall be factory installed.

P. ROOF CURB
   1. Support on full perimeter seismic spring curb with gypsum board acoustical treatments. Mason RSC-A or equal.

Q. BLOWER
   1. Blower section construction, Supply Air: direct drive motor and blower shall be assembled on a 14 gauge galvanized steel platform and shall be equipped with 1.125 inch thick neoprene vibration isolation devices.
   2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
   3. Fan: Airfoil plenum fan statically and dynamically balanced, AMCA certified for air and sound performance, mounted on ground and polished steel fan shafts with ball bearing pillow blocks. Bearings shall be selected for a minimum L10 life in excess of 50,000 hours at maximum catalogued speeds.
   4. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".

R. MOTORS
   1. General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.
   2. Motors shall be 60 cycle, 3 phase 460 volts.

S. UNIT CONTROLS
   1. Greenheck units shall be furnished with complete factory mounted and wired digital controllers to control all functions of the units. All required sensors shall be supplied with the unit and all remote sensors shall be mounted and wired by the temperature controls contractor. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to temperature and relative humidity sensors mounted in the occupied space (48" AFF) and ductwork as required. Controllers shall include a Lonworks or BACnet gateway to permit the BAS to monitor all system

operating parameters of the units – coordinate with the BAS contractor (refer to 23 09 00).

2. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons.
3. Unit supply fan shall be configured for Constant Volume (ON/OFF).
4. Unit exhaust fan shall be configured for damper tracking. Exhaust fan shall be configurable for multiple CFM positions based on minimum OA and economizer OA settings – See Section 23 09 00.
5. Economizer control shall be temperature / dew point.
6. Variable Frequency Drive (VFD): unit shall have factory installed variable frequency drive for modulation of the supply and exhaust air blower assemblies. The VFD shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.
7. Furnish Remote Control Panel for mounting in the occupied space (see plans) for user interface (same as at the unit) without going on the roof. One panel per unit.

T. FILTERS
1. Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the supply air stream. MERV 8 disposable pleated filters shall be provided in the supply final air stream and exhaust air stream.

U. FIELD QUALITY CONTROL
1. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to Architect in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

## 2.04 PACKAGED VARIABLE VOLUME UNIT RTU-25

A. Summary
1. The contractor shall furnish and install package rooftop air conditioning unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.
2. Approved Manufacturers
   a. Trane Voyager or equal by Carrier (Weathermaster Model 50P) or York (Series 40 Model V3).

B. GENERAL UNIT DESCRIPTION
1. Unit(s) furnished and installed shall be combination heating/cooling packaged rooftop as scheduled on contract documents and these specifications. Cooling performance shall be based on AHRI testing procedures. Wiring internal to the unit shall be numbered for simplified identification. Units shall be cULus listed and labeled, classified in accordance with cULus for Central Cooling Air Conditioners. Unit(s) shall be factory assembled, internally wired, fully charged and consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and/or exhaust motors and drives, unit controls and electric resistance heating section.
2. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

C. UNIT CASING
1. Cabinet: Galvanized steel, phosphatized, and finished with a pre-applied baked polyurethane enamel. Cabinet surface shall be tested 672 hours in salt spray in compliance with ASTM B117. Fully gasketed removable access panels. Structural members shall be heavy gauge with access doors and removable panels of heavy gauge. Provide 1/2 inch thick foil faced fiberglass insulation on all exterior panels and roof in contact with the return and conditioned air stream. Cabinet top cover shall be one piece construction or where seams exits, it shall be double hemmed and gasket sealed.

D. ELECTRICAL POWER CONNECTIONS
1. Factory-made penetrations shall be provided for connection of all electrical wiring. These wiring provisions shall be through the knock-out on side of unit. Field penetrations of the unit base pan shall not be acceptable.
2. Unit shall include a phase monitor as standard that protects equipment from phase loss, phase reversal, and low voltage. Any fault condition shall produce a Failure Indicator LED, and send the unit into an emergency stop condition. The entire unit with this option shall be cULus approved. If not, a field UL inspection is required.
3. High Fault Unit Interrupt Rating (Short Circuit Current Rating-SCCR)An optional 65,000 Amp rating (480V) and 25,000 Amp rating (600V) shall be applied to the unitenclosure using a non-fused circuit breaker for disconnect switch purposes. Fan motors,compressors, and electric heat circuits shall be provided with series rated circuit breakers that willprovide the unit rated level of protection. The unit shall be marked with approved cULus markingsand will adhere to cULus regulations.

E. AIR FILTERS
1. Air Filters: Filters shall mount integrally within unit and be accessible through hinged access panels. Filters shall be 2 inch thick pleated glass fiber high efficiency media, 35% dust spot efficiency, 90% arrestance.

F. FANS - SUPPLY
1. Provide forward-curved fan mounted with fixed pitch sheave drive assembly. Complete fans assemblies shall be statically and dynamically balanced.
2. Fan shaft shall be mounted on grease lubricated ball bearings.
3. All motors shall be circuit breaker protected.

G. ELECTRIC HEATING SECTION
1. Electric heater elements shall be constructed of heavy-duty nickel chromium elements internally delta connected for 240 volt, wye connected for 480 and 600 volt. Staging shall be achieved through the unitary control processor (UCP). Each heater package shall have automatically reset high limit control operating through heating element contactors. All heaters shall be individually fused from factory, where required, and meet all NEC and CEC requirements.
2. Electric heater shall be factory supplied and field installed internal to unit cabinet.
3. Electric heater shall be cULus listed and approved and provide single point power connection.

H. EVAPORATOR COIL
1. Provide heavy duty aluminum fins mechanically bonded to internally enhanced, copper tubes.
2. Provide a thermostatic expansion valve for each refrigeration circuit. All coils shall be leak tested at the factory to ensure pressure integrity. The evaporator coil is pressure tested to 450 psig.
3. Unit shall include a Condensate Overflow Switch to shut the unit down in the event that a clogged condensate drain line prevents proper condensate removal from the unit.
4. Unit shall include Sloped Stainless Steel evaporator coil drain pans that are durable, long-lasting and highly corrosion resistant.

I. CONDENSER SECTION
1. Provide all Aluminum Microchannel condenser coils. All condenser coils shall be leak tested at the factory to ensure pressure integrity and pressure tested to 650 psig.
2. Provide integral subcooling circuit(s) to prevent premature refrigerant flashing and to insure maximum operating efficiency.
3. Provide vertical discharge, direct drive fans with steel blades, and three phase motors. Fans shall be statically balanced. Motors shall be permanently lubricated, with built-in current and thermal overload protection in a weathertight casing.
4. Provide tool-less factory installed corrosion resistant louvered hail/vandalism guards to protect condenser coils from hail or physical damage. Wire mesh coil guards shall not be acceptable.

J. REFRIGERATION SYSTEM
1. R410A refrigerant
2. Compressor(s) shall be manufactured by manufacturer of rooftop unit.
3. Provide with thermostatic temperature motor winding control for protection against excessive temperatures caused by over-/undervoltage operation or loss of charge. Also provide high and low pressure cutouts.

4. Provide a High Efficiency Unit (eStage) which shall provide five stages of mechanical cooling with the ability to be at or below 25% compressor displacement at stage one. Achieving this through Hot Gas Bypass shall be unacceptable.

K. EXHAUST/RETURN SECTION
1. Modulating 100% Exhaust Fan with Statitrac Control Option shall include a differential pressure control system, Statitrac, shall use a differential pressure transducer to compare indoor building pressure to outdoor ambient atmospheric pressure and shall turn the exhaust fans on and off and modulate the barometric exhaust dampers to control the building pressure to within the adjustable, specified dead band that shall be adjustable at the RTVM board

L. OUTDOOR AIR SECTION
1. Provide a fully integrated factory installed 100% modulating outside air economizer with unit return and barometric relief air dampers. Economizer operation shall be through microprocessor based primary temperature controls that automatically modulate dampers to maintain space temperature conditions.
   a. Provide economizer with reference enthalpy control.
   b. Provide adjustable minimum position control located through manufacturer's BAS.
   c. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.
   d. Provide Outside Air Measurement (Traq). A factory mounted airflow measurement station (Traq) shall be provided in the outside air opening to measure airflow. The airflow measurement station shall measure from 40 cfm/ton maximum airflow. The airflow measurement station shall adjust for temperature variations. Measurement accuracy shall meet requirements of LEED IE Q Credit 1 as defined by ASHRAE 62.1-2007.

M. ECONOMIZER DAMPERS
1. Provide dampers with a leakage rate not to exceed 2.5% of nominal airflow. Leakage rates shall be based on one inch W.C. static pressure.
2. Leakage rate shall be determined in accordance with AMCA Standard 575.

N. UNIT CONTROLS
1. General: Microprocessor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.
2. Variable Air Volume controls with Variable Frequency Drive: Provide variable air volume supply air temperature control with variable frequency drive without bypass. Provide all necessary controls to operate a VAV rooftop from supply air temperature including microprocessor controller and supply air sensor. The microprocessor shall coordinate the economizer control and stages of cooling with supply air temperature reset capability based upon outdoor air temperature. Variable frequency drive shall be factory installed and tested to provide supply fan motor speed modulation based upon the supply air static pressure setpoint. Field installed variable frequency drives shall not be acceptable.
   a. The following setpoints shall be accessible in the unit control panel: supply air cooling setpoint, morning warmup setpoint, reset setpoint, reset amount, static pressure setpoint, and static pressure deadband.
   b. Compensated Outside Air Control - shall be provided to control outside air damper positioning, maintaining minimum outside air requirements, during operation of variable air volume (VAV) systems.

O. Clogged filter indication: Provide factory installed differential pressure switch to indicate filter replacement status. Differential pressure switch shall cause a contact closure to display a service indication and unit will continue to operate normally.

P. BUILDING MANAGEMENT SYSTEM
1. Interface control module to Energy Management System to be furnished (FACTORY MOUNTING) by rooftop unit manufacturer. Through this interface module, all Energy

Management functions (specified in Energy Management Section) shall be performed. See Building Automation and Automatic Temperature Control System Specifications. The interface module with necessary controls and sensors shall all be factory mounted (not field mounted). If not furnished by rooftop unit manufacturer, this shall be furnished by Energy Management System Contractor for field mounting by said contractor and rated for service up to 140 F. The only field connection to Energy Management System shall be a single communication link.

2. Control Functions: Include unit scheduling, occupied/unoccupied mode, start-up and coast-down modes, nighttime free-cool purge mode, demand limiting, night setback, discharge air set point adjustment, timed override and alarm shutdown.
3. Diagnostic Functions shall include: Unit operating mode, Unit failure status, cooling failure, (heating failure,) emergency service stop indication, supply fan proving, timed override activation, high temperature thermostat status, Zone temperature, Supply air temperature, Cooling status (all stages), Stage activated or not, Stage locked out by UCP, HPC status for that stage, Compressor disable inputs, (Heating status,) Number of stages activated, High temperature limit status, (Economizer status,) (Enthalpy favorability status,) (Requested minimum position,) (Damper position,) (Dry bulb/enthalpy input status,) (Outside air temperature,) (Outside relative humidity,) Sensor Failure: (Humidity sensor,) (OAT sensor,) SAT sensor, RAT sensor, Zone temperature sensor, Mode input, Cooling[/heating setpoints from sensors (CV only), (Static pressure transducer,) Unit mounted potentiometer, SAT from potentiometer (VAV only), Air reset setpoint from potentiometer (VAV only), Unit Configuration data, (Gas or electric heat,) (Economizer present,) High temp input status, Local setpoint, Local mode, (Inlet Guide Vane position/VFD %).
   a. Unit operating mode
   b. Unit failure status
   c. Cooling failure
   d. Emergency service stop indication
   e. Supply fan proving
   f. Timed override activation
   g. High temperature thermostat status
   h. Zone temperature
   i. Supply air temperature
   j. Cooling status (all stages)
   k. Stage activated or not
   l. Stage locked out by UCP
   m. HPC status for that stage
   n. Compressor disable inputs
   o. Number of stages activated
   p. High temperature limit status
   q. Economizer status
   r. Enthalpy favorability status
   s. Damper position
   t. Outside air temperature
   u. OAT sensor (Fail/Normal)
   v. SAT sensor (Fail/Normal)
   w. RAT sensor (Fail/Normal)
   x. Zone temperature sensor (Fail/Normal)
   y. Mode input (Fail/Normal)
   z. Cooling/heating setpoints from sensors (CV only) (Fail/Normal)
   aa. Static pressure transducer (Fail/Normal)
   bb. Unit mounted potentiometer (Fail/Normal)
   cc. SAT from potentiometer (VAV only) (Fail/Normal)
   dd. Air reset setpoint from potentiometer (VAV only) (Fail/Normal)
   ee. Unit Configuration data
   ff. Electric heat
   gg. Economizer present
   hh. High temp input status
   ii. Local setpoint

jj. Local mode

4. Provide capabilities for Boolean Processing and trend logs as well as "templated" reports and logs.

Q. ROOF CURBS

1. Unit to be installed on full perimeter seismic spring curb, Refer to Section 23 05 29. Curb shall include acoustical treatments.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Maintain all manufacturer recommended service and operating clearances at all units. Verify minimum ten feet of clearance between any roof mounted unit and the edge of the roof per IMC requirements. Do not locate units closer than ten feet to the roof edge unless suitable parapet or protective guards (min 42" high) are in place. Guardrails, where required, must be as defined in the International Building Code.

B. Verify that the proper power supply is available.

C. Verify the tops of all supports are level and duct openings properly positioned.

### 3.02 INSTALLATION

A. All units shall be installed in strict accordance with the manufacturer's written installation instructions.

B. Set new rooftop units (except RTU-24, RTU-25, RTU-35 and RTU-36) on 18" tall factory fabricated full perimeter seismic roof mounting curbs. Curbs shall be insulated. Tops of curbs shall be level. Where required, curbs shall be supplied with the proper pitch to match the roof slope - field shimming of curbs will not be acceptable.

C. Set all neutral air ventilator units as well as RTU-24, RTU-25, RTU-35 and RTU-36 on 24" tall full perimeter seismic spring curbs. Spring curbs having acoustical treatments. Refer to Section 23 05 29.

D. Maintain all manufacturer's recommended service and operating clearances.

E. Coordinate duct penetrations thru the roof with roof framing prior to beginning any fabrication or installation. **All roof decking and roof insulation shall be continuous under the units except for the required duct openings.** Furnish and install all perimeter angles around the interior of the roof curbs for support of the metal roof deck and insulation as required. Cut and patch existing roof as required.

F. Provide temporary filtration for all units operated during the construction phase. At the completion of construction, after the building has been substantially cleaned and immediately prior to the owner's occupancy of the building, replace all unit filters with new, clean filters of the type specified. In addition to these new filters in the unikts, provide spare filters for each unit as specified in this section.

### 3.03 MANUFACTURER'S FIELD SERVICES

A. Provide initial start-up and shut-down during first year of operation, including servicing and check-out. Verify proper set up of controls. Start-up reports for each unit shall be included in the close-out documents submitted to the architect.

B. Provide up to 8-hours owner training on unit controls, programming, operational scheduling, remote control panel operation (Greenheck units) and sequence of operation.

C. Manufacturer shall furnish a factory trained engineer to assist with the start up of variable volume rooftop unit RTU-25.

**END OF SECTION**

# SECTION 16010
# ELECTRICAL GENERAL PROVISIONS

## PART 1 - GENERAL

### 1.1 REQUIREMENTS:

A. The work under this section of the work is subject to the provisions of the General Conditions, Supplementary Conditions and Division 1 - General Requirements, all of which are hereby incorporated herein and by this reference made a part thereof.

B. The Contractor shall be governed by all of the provisions of the aforementioned Contract Documents and all other Contract Documents of which in any way affect the work herein specified.

### 1.2 WORK INCLUDED:

A. Examine all drawings and specifications, including the General and Specific Conditions which are a part of this Contract.

B. All labor, materials, equipment transportation, construction plant and facilities necessary for the proper execution and completion of the work as defined and required by the Contract Documents. Also, all work not specifically included in the Contract Documents which is reasonably and properly inferable therefrom or accepted trade practice necessary for the proper completion of this work.

C. The electrical scope of work shall include, but is not limited to the following major components, products and complete operable systems:

1. Electric distribution system including feeders, panelboards, main switchboard, transformers, disconnects, etc.
2. Emergency lighting and power and generation system.
3. Lighting fixtures, lamps and controlling devices.
4. Convenience and power outlet systems.
5. Telephone conduit and outlet system.
6. Grounding systems.
7. Power connections to all heating, ventilating and air conditioning equipment except where noted otherwise.
8. Branch circuit conduit and wire.
9. Fire alarm system.
10. Surface mounted raceway systems.
11. Trench and backfill.
12. Exterior lighting systems.
13. Electrical system seismic protection.
14. Cable management system.
15. Transient voltage surge protection system.
16. Marking tape.
17. Conduit fire stop devices.
18. Rough-in and final connections to Owner furnished equipment where indicated.
19. Rough-in to security system.
20. Rough-in conduit for EMS (Energy Management System).
21. Rough-in conduit to classroom television (CTV) and voice/data systems.

### 1.3 REFERENCES:

A. The Construction Agreement, instructions to bidders and all other general requirements of these specifications shall be considered a components part of this Division of the specifications.

B. The Contractor shall be governed by all of the aforementioned Contract Documents and all other Contract Documents of which in any way affect the work herein specified.

**1.4 RELATED WORK SPECIFIED ELSEWHERE:**

A. Exclude items furnished under other Divisions:

1. Motors, starters, controls, control wiring, conduit and connections, etc., for HVAC and plumbing equipment will be furnished under Division 15 - Mechanical, Power Connections only will be made under this Division, unless noted differently on the drawings.
2. Painting, except repair of factory applied finishes on equipment and as specified.
3. Concrete, masonry work and finish painting.
4. Voice/data and security systems.
5. Classroom intercom and CTV system.
6. Cafetorium and gymnasium sound systems.
7. Kitchen equipment.
8. Elevators.

**1.5 ELECTRIC SERVICE:**

A. The electric service as furnished by Entergy will be 480Y/277 volts, 3 phase, 4 wire (wye), 60 Hertz.

B. Contact Utility prior to bidding regarding electric service and service requirements and modifications.

C. Coordinate all service work with Entergy and furnish all service materials and metering in accordance with their requirements. The Owner will be responsible for all service line extension costs by Utility if required.

**1.6 TELEPHONE SERVICE:**

A. Coordinate with the Owner's telephone equipment installer and install conduits, outlets, fish wires, as required for the installation and hook-up of Owner furnished telephone system.

**1.7 PERMITS, CODE REQUIREMENTS AND FEES:**

A. All work shall conform to the rules and regulations of the latest edition of the National Electrical Code, including all subsequently published addenda thereto. Include all items of labor and materials required to meet such Code regulations regardless of the failure to mention in the in the specifications or show on the drawings each individual item.

B. The work shall also conform to the latest established standards of the Institute of Electrical Electronic Engineers (IEEE), National Electric Manufacturer's Association (NEMA); and State, and Local County electrical codes, and other authorities having jurisdiction.

C. The foregoing standards shall be followed by the Contractor as minimum requirements. They shall not relieve the Contractor from furnishing and installing higher grades of materials and workmanship that may be specified herein or indicated on the drawings.

D. Take out all necessary permits and pay all fees in connection with work under this Division.

E. At the completion of the project, secure and turn over to Owner certificates of inspection, properly signed by the controlling building department which shall state that all rules have been complied with and that the work is approved as installed. Provide copies of certificates with operating and

maintenance brochures. Acceptance by local building officials shall not relieve Contractor from furnishing materials specified in contract documents.

**1.8 ACCURACY OF DATA, DRAWINGS AND INTERFERENCES:**

A. Electrical drawings are intended to indicate only the extent diagrammatically, general character and location of the work included. Work intended, but having minor details obviously omitted or not shown shall be furnished and installed complete to perform the functions intended.

B. Examine carefully all contract drawings as well as the electrical drawings. Install equipment as nearly as possible to the locations and arrangements as indicated. Provide minor adjustments as necessary to coordinate the electrical work with the Architectural and Mechanical systems and to avoid all interferences therewith. All offsets, rises, pull boxes and fittings are not necessarily shown on the drawings; however, these shall be provided as required.

C. All building dimensions, elevations, etc., shall be taken from the Architectural Drawings or by site measurements.

**1.9 RECORD AS-BUILT DRAWINGS:**

A. Upon completion of the project, deliver to the Architect, one set of reproducible "As-Built" vellums and one set of electronic Auto-Cad drawing files. As-Built drawings shall show the actual installation locations, depths, and sizes of all underground electrical work. Switchboard, panelboard and lighting fixture schedules shall be modified to indicate actual products and manufacturers installed. Drawings shall indicate all homerun locations and circuit groupings.

B. Make field measurements of the installed locations of all underground electrical work as work progresses. Show all locations by dimensions from permanent readily identifiable reference points such as building walls, columns, curbs, drives, etc. Show all depths by dimensions below finished grade.

C. Maintain on the job site, in a suitable container, a clean set of record plans with daily updates of as-builts marked in red. These plans shall not be used for any other purpose.

D. See Section 01720 for additional requirements.

**1.10 AS-BUILT RISER DIAGRAM:**

A. Furnish an As-Built riser diagram enclosed in suitable (1/4") laminated plastic frame mounted adjacent to main electric service.

B. The riser diagram shall include instructions from the switchgear manufacturer on how to energize and de-energize each major component of the electrical system. Describe what actions should be taken under emergency power conditions, how to restore power following a power outage and what precautions to take when maintenance is required.

C. Instruction shall be submitted to the Architect for approval and corrections prior to framing.

**1.11 INSPECTION OF SITE:**

A. Prior to bidding work under this Division, visit the site of the proposed work and thoroughly observe conditions to be encountered. Failure to make such preliminary observation and inspection shall in no manner relieve the Contractor in the complete and proper execution of work described herein and/or as may be necessary to meet all requirements of the job.

B. Refer to Section 00200 for additional requirements.

C. Refer to General Conditions and Division 1 specifications for pre-bid meeting requirements that may affect bidding work for this project.

**1.12 PRODUCTS:**

A. Materials and workmanship in the installation shall be of the best for the purpose intended and shall meet with the approval of the Architect. The Architect/Engineer reserves the right to reject any materials and workmanship not in accordance with those specified or not meeting the Architect/Engineer approval, either before or after installation.

B. All materials shall be new, with UL label where available. If UL label is not available, material shall be manufactured in accordance with applicable NEMA, IEEE and Federal Standards. Labeled products shall be utilized and installed per manufacturer's instructions so that labeling is not violated.

C. Materials and/or equipment specified herein to be of a certain manufacture or brand are used to establish minimum quality standards. Materials and/or equipment of other manufacture may be submitted for substitution provided that they meet all space requirements and capacities specified. Materials submitted for substitution shall be given consideration only when furnished with complete catalog cut-sheets and, when requested, product samples. All substitutions shall be submitted at least 10 days prior to bid date and shall have written approval prior to bidding.

**1.13 SUBMITTALS:**

A. Prior to ordering any equipment, the electrical contractor shall furnish for the Architect's approval submittal brochures. Submittals shall include the following:

1. Main switchboard with labels
2. Surge protective devices (TVSS)
3. Panelboards with labels
4. Transformers
5. Disconnect switches
6. Fire alarm system
7. Cable management system
8. Seismic restraint products
9. Lighting fixtures and lamps
10. Wiring devices/cover plates
11. Surface mounted raceway systems
12. Wire/cable
13. Boxes
14. Conduit systems, junction boxes and fittings
15. Exterior pull boxes
16. Expansion fittings
17. Fuses/spare fuse cabinet
18. Wire and cable connectors
19. Wall and conduit fire stops

B. Submittals shall include Contractors name and telephone number, Distributors name and telephone number, Manufacturer's name and product, catalog cut-sheets complete with product descriptions, weights, dimensions and all applicable device ratings (volts, amps, watts, interrupting ratings, etc.)

C. All equipment shall be submitted in an indexed bound hard back 3 ring binder for the electrical division. All items shall be submitted at one time, partial submittals will not be considered.

D. Switchboards, panelboards, transformers and similar products shown on drawings were sized to match manufacturer specified. If an alternate manufacturer is submitted, a ¼" scale drawing of each electric space shall be provided showing proposed equipment layout. All code required

working clearances shall be shown on layouts. Failure to submit room layouts will result in alternate manufacturers being rejected.

E. Point-by-point lighting calculations shall be provided for all substituted site lighting fixtures. These calculations shall be to the same scale as the Contract Documents, with lighting levels shown every ½ scale inch. Calculations shall clearly indicate initial lamp lumens and all maintenance factors. Provide copy of IES photometric file for each substituted light fixtures on electronic media. Failure to submit point-by-point calculations will result in alternate manufacturers being rejected.

F. Re-Submittal of products changing manufacturer after similar products have been submitted and approved will result in engineering charges for re-review of electrical shop drawings. An engineering fee will be quoted and approved before any re-approval of drawings.

G. Catalog cut-sheets including multiple products or multiple product options and accessories shall be clearly marked to indicate products and options being furnished. Failure to identify products will result in submittals being rejected.

H. Refer to Section 01300 for additional requirements.

## 1.14 OPERATING AND MAINTENANCE MANUALS:

A. Three sets of approved submittal brochures shall be prepared as "Operating and Maintenance Manuals". Operating and Maintenance Manuals shall include in addition to the submittal data, all equipment operating instruction books, parts list, wiring diagrams, product warranties and certifications.

B. O & M Manuals shall be bound and indexed. Covers shall be labeled with project name, data, Contractor, Architect and all responsible vendors.

C. Provide detailed warranty information for all products furnished with extended warranties. This information shall include name of manufacturer, telephone number for in warranty repair and service and proof of purchase date. Products that may include extended warranty are lighting fixtures, electronic ballasts, battery operated emergency lights, fire alarm and generators, lightning protection systems.

## 1.15 SAFETY DEVICES:

A. Provide suitable guards when not furnished by manufacturer to enclose all wire connection, electrical contacts, etc. Guards shall be sheet metal or rigid electrical insulating material rigidly secured so as to be readily accessible and shall meet OSHA standards.

B. Provide warning signs to caution people of possible dangers to high voltage and energized live parts, and or special operating procedures.

## 1.16 TEMPORARY UTILITIES:

A. Refer to Section 01500.

B. All temporary wiring for construction power shall conform to Article 590 of NEC and all applicable rules and regulations of OSHA.

## 1.17 PROTECTION OF WORK:

A. The Contractor shall protect his work at all times from the danger of freezing, breakage, dirt, foreign materials, etc., and shall replace all work so damaged. Make every precaution to protect the work of others, and be responsible for all damage to other work.

**1.18 STORAGE OF MATERIALS:**

A. Make provisions for the delivery and safe storage of all materials and arrange with other Contractors on the job for the introduction of materials to expedite the work as a whole. Mark and store all materials in such a manner as to be easily checked and inspected. Where materials are indicated to be furnished by others to the Contractor for installation, make a complete and careful check of all materials received and furnish a receipt acknowledging acceptance of the delivery and condition of the materials received. After such acceptance, assume full responsibility for the safe keeping of same until such a time as the completed installation has been approved and accepted.

**1.19 OPENINGS THROUGH WALLS, FLOORS AND ROOF:**

A. Verify that all openings through walls, floors, ceilings, roofs and through any other parts of the structure shall be properly sized and located.

B. All conduit connections to roof mounted HVAC equipment shall be made concealed through equipment curbs - no conduit roof penetrations will be allowed unless noted on the drawings.

C. Reinforced concrete beams and pre-stressed and/or post-tensioned slabs shall not be cut without structural engineering approval.

**1.20 DRILLING, CUTTING, AND PATCHING:**

A. Furnish all cutting, chipping, drilling, etc., as may be necessary for the proper installation of Division 16 work. Care shall be taken in such cutting and chipping so as not to cause excessive repair work.

B. Refer to Section 01045 for additional information.

**1.21 PAINTING:**

A. Provide a prime coat of paint for all supports, hangers, frames, etc., furnished and installed under this section of the specifications.

B. Touch-up equipment finishes where factory finish is damaged.

C. Refer to Section 09900 for additional requirements.

**1.22 IDENTIFICATION OF EQUIPMENT AND SYSTEMS:**

A. Identify all items of equipment and circuitry throughout building.

B. Equipment shall be identified with engraved laminated plastic permanently attached by screws to apparatus. Identification nomenclature shall be same as that on Contract Drawings except where specifically requested otherwise by Owner.

C. Each multipole circuit breaker or switch in power or distribution panelboards and switchboard shall have engraved nameplate of Micarta or similar materials. Contractor shall submit completed nameplate schedule for approval.

D. All wiring shall be color coded and identified by tags in order to facilitate checking of work by those so authorized. Provide engraved nameplates or stencil identification, as appropriate, data on the starters, disconnect switches, etc., for all motors under Division 15 of the Specifications. This data shall be in accordance with the designation given the motors on the Mechanical Drawings.

E. Each junction box cover shall be labeled to indicate circuit numbers contained in that box. Use black indelible pen to label boxes.

F. Exterior junction boxes shall have circuit numbers labeled with engraved nameplates screwed to the covers.

**1.23 TESTING AND ADJUSTMENTS:**

A. Insulation Test: Prior to energizing equipment or circuits, all panelboard, and all feeder and branch circuit conductors, all motors, transformers, etc., shall be insulation tested with a direct current Megohm Meter similar to Biddle Co., "Megger". Submit test results with Operating and Maintenance Brochures at completion of project.

B. All wiring shall be so installed that when completed, the system will be free from short circuits and grounds except as allowed by Article 250 of National Electrical Code.

C. Correct all short-circuit and unintentional grounds and all low reading circuits. Notify equipment suppliers of all questionable test results and remedy same as directed by equipment manufacturer.

D. Test grounding electrode system resistance using an "Earth Resistance Tester" using the three electrode fall of potential type test. Where grounding resistance exceeds 25 ohms, notify Architect for instructions on reducing grounding resistance. Measurements shall be taken at building service entrance and at secondary of each step down transformer. Submit test results with Operating and Maintenance Brochures at completion of project.

E. Check and adjust all equipment to operate smoothly, quietly and in accordance with manufacturer's installation, maintenance and start-up instructions.

F. All auxiliary and cable systems shall be tested for proper operation. Owner's personnel shall be thoroughly familiarized with the proper operating procedures for each system.

**1.24 OBSERVATION OF WORK AND DEMONSTRATION OF OPERATION:**

A. At final inspection, open panel and switchboard covers, junction box covers, pull boxes, device covers, and other equipment with removable plates for inspection. Provide sufficient personnel to expedite cover removal and placement.

B. Contractor shall assist Manufacturer in demonstration and operation of new systems to satisfaction of Owner.

**1.25 WORKMANSHIP, GUARANTEE (QUALITY ASSURANCE):**

A. Work under this Division shall be first class with emphasis on neatness and workmanship.

B. Install work using competent mechanics, under supervision of foreman, all duly certified by local authorities. Installation is subject to Architect/Engineer periodic observation, final approval, and acceptance. All unsuitable work will be rejected!

C. Refer to Section 01010 for warranties and additional requirements.

**1.26 EXCAVATION AND BACKFILL:**

A. Provide all necessary excavation and backfilling in connection with the electrical work. Cut all trenches to proper line and grades to provide full length bearing of all raceways on the ground. Provide 36" minimum depth from finished grade to top of raceway unless noted otherwise.

B. After raceways have been laid, tested and approved, carefully tamp backfill around raceways in conformance with Section 02200 requirements.

C. Provide yellow warning tape in trench 12" below grade. Leave end of tape exposed until trenches have been inspected.

**1.27 CLEAN-UP:**

A. Maintain premises free from accumulation of scrap material, shipping materials, etc., caused by work herein, so as to provide a safe and orderly work place.

B. At completion of work, remove all surplus materials, tools, etc., and leave premises "broomclean". Clean all lighting fixtures, lamps and lenses, remove all construction debris from panelboards, switchboards and similar equipment.

**1.28 SWITCH AND RECEPTACLE LOCATIONS:**

A. The right is reserved to change the location of any electrical device a maximum distance of ten feet from the location indicated, without charge, provided that the change in location is made prior to device rough-in.

**1.29 ALTERNATES:**

A. The Contractor is referred to the Bid Form for alternates that will affect pricing of Division 16 work.

**END OF SECTION**

# SECTION 16050
# BASIC MATERIALS AND METHODS

## PART 1 - GENERAL

### 1.1 REQUIREMENTS:

A. The General Documents form a part of this section.

B. Section 16010, Electrical General Provisions, shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work included under this section shall consist of furnishing and installing raceway and wiring systems with associated junction and outlet boxes, devices and equipment as indicated on the drawings and described herein.

## PART 2 - PRODUCTS

### 2.1 CONDUITS:

A. Exposed conduit below 8 ft. AFF and all exposed exterior conduit except where noted differently on the contract drawings shall be rigid steel conduit of high grade, open hearth, welded steel pipe of standard weight, conforming to Federal Specifications WWC-581 ANSI, C80.1 and UL Standard #6. All other conduit shall be EMT, Electrical Metallic Tubing.

B. The last 36" of conduit to motors and transformers and other vibrating equipment shall be liquid-tight, flexible electrical conduit with internal grounding conductor as sized by Code.

C. All conduit shall be 3/4" minimum diameter except for switch legs which may be 1/2" diameter.

D. Where conduit is used in concrete slabs or underground applications, use Schedule 40 PVC rigid plastic conduit as manufactured by Carlon or approved equal. All below grade elbows and all conduit turn-ups out of slabs, shall be made with GRS elbows.

E. Couplings and connectors for all EMT conduit systems shall be set screw type of galvanized or sherardized steel (Die cast fittings, will not be acceptable). Fittings shall be concrete tight. Fitting installed in wet locations shall be rain tight.

F. All rigid steel conduit fittings shall be threaded galvanized steel.

G. Type MC or AC cable will not be an acceptable wiring method for this project.

### 2.2 WIRE AND CABLE:

A. All feeders and branch circuit wiring shall be type THWN suitable for 75 degree C normal conductor operation and shall be rated 600 volts of not less than 12 gauge except where noted differently.

B. All wire and cable shall be stranded, all conductor sizes.

C. Wire and cable color coding shall be as follows:

| PHASE | 120/208 V | 277/480V |
|---|---|---|
| A | BLACK | BROWN |
| B | RED | ORANGE |
| C | BLUE | YELLOW |
| NEUTRAL | WHITE | WHITE/STRIPED |
| GROUND | GREEN | GREEN |

D. Grounded conductors #6 and smaller shall be identified by a continuous white or natural gray outer finish. Conductors larger than #6 shall be continuous white color or by three bands of white tape on any color insulation other than green per Article 200-6 (a) and (b) of NEC.

E. Grounded conductors of different systems shall have a white covering with readily distinguishable and different colored strip (not green) running along the insulation per Article 200-6 (d) of NEC.

F. Use factory color coded wire for No. 12 and No. 10 gauge. Use two bands of color tape for No. 8 and larger conductors.

G. All wire and cable furnished under this section shall be "Copper". No aluminum cable will be allowed.

H. Isolated ground conductors shall be green with orange spiral.

## 2.3 WIREWAYS:

A. Wireways or wiring troughs, if used to facilitate wiring, shall be Square "D" Hinge Cover Lay-in Duct or General Electric Type HW with necessary connections and fittings.

## 2.4 WIRING DEVICES:

A. Devices where possible shall be of the same manufacturer and shall be as manufactured by Hubbell, Cooper, Leviton or Pass & Seymour. Unless noted otherwise, wiring device and cover plate colors shall be selected by Architect.

B. Wall Switches: Wall switches in general shall be installed 48" above the floor on the strike side of the door. Switches shall be quiet operating, heavy duty specification grade, rated 20 amps, 120/277 volts, A.C. Switches shall be designed for back wiring with stranded wire. Switch mounting straps shall be brass with grounding screw terminal. Switches shall be Leviton as follows:

| | | |
|---|---|---|
| SPST | LEVITON | #1221-2 |
| SPDT | LEVITON | #1222-2 |
| SPDT (3-WAY) | LEVITON | #1223-2 |

C. See Specification Section 16501 for Network Lighting Controls.

D. Duplex Outlets: Receptacles shall be heavy duty specification grade of the polarized grounding type. Devices shall be designed for back wiring with stranded wire. Device mounting straps shall be brass with grounding screw terminal. Devices shall be Leviton Catalog #5362 rated 20 amps, 125 volts.

E. GFCI Outlets: Ground fault circuit interrupting outlets shall be heavy duty specification grade, 20 amp, 125 volt. Devices shall be designed for back wiring with stranded wire and shall have brass mounting straps and grounds screw terminal. Outlets shall have UL lockout feature that prevents a device from being reset if improperly wired and when device malfunctions. Devices shall be Leviton #7899 series with LED indicator.

F. Isolated Ground Outlets: Isolated ground outlets shall be heavy duty specification grade rated 20 amps, 125 volts. Devices shall be designed for back wiring with stranded wire. Device mounting strap shall be brass with box grounding screw. Receptacle ground pins shall be isolated from device mounting strap and shall terminate in an isolated ground conductor screw. Devices shall be Leviton Decora Style #16362-IG*.

G. Weatherproof outlets: Weatherproof outlets shall be Leviton #W7899-GY weather resistant device with Red Dot "Code Keeper" #CKMU (horizontal) or #CKMUV (vertical) die-cast aluminum, in-use, weather resistant cover. Roof mounted weatherproof outlets used to service HVAC equipment shall have single gang cast aluminum surface mount box for installation.

H. Voice/Data Outlets: Voice/data outlets shall be 2 gang boxes with appropriate single gang plaster or masonry trim ring. Install outlets 18" above finished floor unless noted differently. Cover plates shall be of the configuration selected by Owner. Provide blank cover plates for all unused/open locations.

I. Power Outlets: Power outlets shall be of the ratings and NEMA configurations required by equipment as specified on the drawings. Outlets shall be as manufactured by Leviton as required, Catalog IPD 2.03, Page B9-B14.

J. Floor Outlets: Floor boxes shall be as manufactured by Steel City series 664-Cl complete with all necessary fittings, covers, wiring tunnels, voice, data, power and A/V components for complete installation. Floor box color shall be as directed by Owner.

K. Device Plates: Device plates for switches, outlets and all other wiring devices shall be 302 smooth stainless steel.

L. Surface Mounted Raceway Systems: Furnish Panduit Series TG-70 surface mounted raceway (2 compartment) where noted on drawings. Outlets shall be rated 20 amperes of the type and spacing indicated on the drawings. Furnish combination duplex receptacle and data outlet with "Activate" style data insert as selected by Owner. Furnish all necessary fittings, attachments and accessories for complete installation.

M. Television Outlets: Television Outlets shall be 2 gang box with internal divider between duplex power outlet and coaxial/CAT5E connector. Duplex power outlet shall be Leviton Decora Style #16362. Data connector shall be similar to Leviton communication outlet Decora Style #41658 with type "F" coaxial connector and 6-conductor communication outlet. Furnish 2 gang combination Decora Style coverplate.

## 2.5 PULL BOXES, OUTLET BOXES AND FITTINGS:

A. Pull boxes or junction boxes, where shown on the drawings or where required to facilitate pulling of wires or cables, shall be of proper size and shape as required by Section 370 of NEC. Large pull boxes and junction boxes shall be 12 gauge steel, with 2 coats of shop applied light gray rustproof enamel paint over phosphatized primer. Covers shall be of the same gauge as the boxes, and secured to boxes with proper number of screws.

B. All metallic conduit fittings shall be galvanized or cadmium plated, adapted to type of conduit system installed. All plastic fittings shall be Schedule 40 of the same manufacturer as conduit. Fittings shall meet all requirements for the Underwriter's Laboratories, Inc., and the National Electrical Code.

C. Each switch, light, receptacle, and other miscellaneous device shall be provided with an outlet box.

D. Boxes shall have only the holes necessary to accommodate the conduit at point of installation. All boxes shall have ears to secure covers.

E. Ceiling outlet boxes, where used with conduit that is concealed, shall be not less than 4" in diameter by 1-1/2" deep.

F. Outlet boxes where used with conduit that is concealed shall be not less than 4" in diameter to provide a seat for fixture canopy.

G. All boxes shall be rigidly secured in position. All concealed boxes for fixtures, switches, receptacles, telephone, etc., shall be so set that the front edge of box shall be flush with finished wall or ceiling line. When located near doors or windows, they shall be close to trim.

H. Wall switch outlets shown at the door locations shall be installed on lock side of the door.

I. Plaster flanges and masonry trim rings for outlet and switch boxes shall be of proper depth to match face of finished wall or within 1/8" maximum setback. Where boxes or covers do not match the face of finished wall and set back is 3/16 or more, install Bridgeport "Receptxtenders" between box and device. In all cases the device yoke shall be securely supported by the box face without the support of the surrounding sheet rock.

**2.6 EXPANSION FITTINGS:**

A. Where construction expansion joints are encountered in conduit runs, the Contractor shall furnish and install conduit expansion joints as manufactured by O.Z. type "AX" with jumper cables for rigid conduit and type "TX" with bonding jumpers for EMT conduit, T&B, Rayco or approved equal.

**2.7 CONDUIT FIRE STOPS:**

A. Furnish and install on all conduit penetrations of fire walls, fire stops as manufactured by 3M or equal with UL rating equal to rating of wall penetrated.

**2.8 CONDUIT SEALS:**

A. Furnish and install duct sealant in all telephone and communication conduits that enter the building from below grade. Seal all conduits that enter switchboards from below grade. Seal conduit penetrations of below grade walls. Sealant shall be American Polywater FST Foam Duct Sealant or approved equal.

**2.9 CONDUCTOR SUPPORTS:**

A. Conductors in vertical raceways shall be supported as required in Article 300-19 of NEC.

**PART 3 - EXECUTION**

**3.1 GENERAL:**

A. All the conductors in this installation shall be run in conduits, except where noted differently. Equipment and devices installed by the Contractor and not constructed with enclosures especially suited for mounting and enclosing all live parts shall be installed in metal cabinets furnished by the Contractor. It is intended that complete raceways or enclosures be provided for all circuiting throughout the extent of all the systems specified.

B. All conduit shall be reamed after threads are cut. All ends shall be cut square and shall butt solidly into couplings.

C. All exposed conduit shall run parallel to walls in the most direct manner and shall be securely attached with Minerallac conduit mounting straps. When anchoring straps to masonry surfaces, use metal expansion anchors or Phillips steel inserts or approved equal. Metallic conduits exposed

to damp or wet locations shall have a ¼" air space between conduit and supporting surface. Use a 1 hole galvanized conduit strap and clamp back or approved equals. Horizontal runs shall be run with slight incline without forming low spots, in order that they may drain properly.

D. Conduits shall be run with smooth, easy bends. They shall be held in boxes with locknuts and shall have bushings for protection of the wires.

E. Additional pull boxes, junction boxes, or conduits, where required to facilitate pulling of wires, shall be of the proper size and shape for the conduits and wires entering them.

F. Where conduits enter switchboards, panelboards, etc., locknuts and grounding bushings shall be provided. Bushings shall be insulated where the wires are 6 gauge or larger. Grounding bushings will be required on feeder conduits to all panelboards and transformers. Branch circuit conduits feeding isolated ground outlets shall also have grounding bushing.

G. Locknuts and grounding bushings shall be provided at all switchboards, panelboards and at each termination or junction point of the raceway for all feeder and branch circuits per NEC Article 517-19.

H. All conduit openings shall be temporarily plugged to exclude water, concrete and other foreign substances during construction. All conduits shall be cleaned before the wires are installed.

I. A lubricating compound such as Ideal Yellow 77, or approved equal may be used to facilitate wire pulling.

J. The contractor shall be responsible for all wall openings and sleeves necessary to complete the electrical conduit system within the building. Coordinate the installation of all openings with the General Contractor.

K. Consult the General Contract Drawings for height and location of all brackets, receptacles and switch outlets not specified herein. Unless noted otherwise, device mounting heights shall be as follows:

| | |
|---|---|
| DUPLEX CONVENIENCE OUTLETS | 18" ABOVE THE FLOOR |
| DUPLEX CONVENIENCE OUTLETS ABOVE COUNTERS | CENTER 7" ABOVE BACK-SPLASH |
| TELEPHONE, OUTLET | 18" ABOVE THE FLOOR |
| WALL SWITCHES AND FIRE ALARM MANUAL STATIONS | 48" ABOVE THE FLOOR |
| FIRE ALARM/LIGHT COMBINATION | 80" ABOVE THE FLOOR |
| TELEVISION OUTLETS | PER ARCHITECT |

N. Carefully lay out all outlets and coordinate with other trades so that the outlets are not blocked, hidden or inaccessible for use or maintenance.

O. Lighting and receptacle wiring circuits shall be installed in accordance with the layout shown on the drawings and shall be balanced to 5 percent about the neutral in branch circuit panels.

P. Branch circuit wire sizes shall be as noted on drawings. Where wire sizes are not shown wiring shall be as follows:

| 20 Amp 120 Volt Branch Circuits | |
|---|---|
| Distance from panel to 1st device | 60 Ft use #12 |
| Distance from panel to 1st device | 61 Ft to 120 Ft use #10 |
| Distance from panel to 1st device | 121 Ft to 160 Ft use #8 |
| **20 Amp 277 Volt Branch Circuits** | |
| Distance from panel to 1st device | 140 Ft use #12 |
| Distance from panel to 1st device | 141 Ft to 250 Ft use #10 |
| Distance from panel to 1st device | 251 Ft to 350 Ft use #8 |

Q. Individual neutrals shall be provided for each phase unless noted otherwise. Multi-wire branch circuits shall be prohibited except where required by systems furniture manufacturer. Multi-wire systems furniture shall be connected to multi-pole branch breakers. Each 120V and 277V circuit shall be provided with a dedicated neutral.

R. Multi-wire branch circuits (circuits that share a neutral) shall not be allowed. Each branch circuit shall be furnished with an individual neutral. Where multi-circuit homeruns are shown, each neutral conductor shall be identified with a colored stripe to match the associated phase conductor color.

S. No grouping of 3 phase circuits will be allowed except where noted on drawings.

T. All conduit shall be supported independently from ceiling system with approved supports. Tie wire is not an approved support.

U. All empty conduit systems installed for wiring by others, shall be provided with pull lines. Pull boxes shall be installed as required so that there is not more than 150 feet between access points to the conduit system (s).

## 3.2 ELECTRICAL SUPPORTING DEVICES:

A. Furnish and install all necessary hangers, supports, fasteners, platforms, frames and all other similar construction materials necessary for the proper and safe support of all conduit and equipment furnished under this Division of the Specifications.

B. Supports for lighting fixtures, panelboards, exposed feeders, etc., shall be UL approved. Lighting fixtures shall not be supported from the ceiling framing system. See seismic specifications for additional support requirements.

C. Conduit shall be securely supported, strapped, or otherwise attached to the building structure in an approved manner. Conduit shall be firmly fastened within 3 feet of each outlet box, junction box, cabinet or fitting. Conduit shall be supported at intervals not to exceed those specified in Chapter 3 of National Electric Code. Conduits shall not be supported by ceiling or grid wire of lay-in ceiling.

D. In concrete slabs, install conduits under reinforcing steel and separate parallel runs a minimum of six (6) inches except at point of vertical rise to panelboard or outlet.

## 3.3 WIRE AND CABLE CONNECTIONS:

A. Branch circuit wiring 10 gauge and smaller shall be terminated with solderless, screw-on pressure type terminators and insulators similar to Ideal wirenuts. Connectors shall be UL listed and color coded for wire sizes and quantities involved. Connectors used in below grade boxes shall be water tight.

B. Terminators to electrical equipment, i.e. circuit breakers, switches, panelboard busses etc., shall be made with a suitable hex or screw head box lug as provided by the equipment manufacturer. When

no suitable box type lug is provided the Contractor shall finish and install a box type lug similar to T&B Reddy Lug, or Burndy Universal terminal type KA or K2.

C. Set screw pressure connectors shall be tightened to the manufacturer torque values included in the instructions listing or labeling. When such values are not available, the torque values listed in NEC 99 tables 1.3 through 1.6 shall be used as a guide.

D. Terminations requiring a bolted connection to NEMA type blades or pads shall be made with a Crimp Joint connector. The connector shall be a one piece tubular construction made of pure electrolytic copper, tin plated for corrosion resistance. The connector shall be so designed that indents may be made on any portion of the barrel circumference. Terminations shall be type YAV for #8 AWG, Type YA-1 for #6 through 4/0 AWG, Type YA for 250 MCM and larger or approved equal. Indents shall be made with a hydraulic compression tool designed to lock the connector into the tool until a complete positive connection has been made. Terminations shall be Burndy HYLUG or approved equal.

E. Butt type terminations for wire #8 gauge and larger shall be made with inline compression connectors and thick wall heat shrink insulation. Splices shall be similar to Burndy Insulated HILINK or approved equal.

## 3.4 PLUMBING EQUIPMENT WIRING:

A. Furnish and install all power wiring for plumbing equipment as required and noted on the drawings.

B. Furnish and install outlets for drinking fountains coordinating locations with Division 15. Outlets shall be installed behind drinking fountain enclosure where hidden from normal view.

## 3.5 HVAC EQUIPMENT WIRING:

A. All power wiring to operate the HVAC equipment shall be furnished by the Electrical Subcontractor, except wiring that is factory installed on equipment.

B. All control wiring including conduit, wire and devices to operate the HVAC and Plumbing systems including interlock wiring shall be furnished and installed under Division 15. Provide 20 amp, 120 volt control circuit to each control panel specified or detailed in contract documents. Control circuit shall originate from nearest normal or emergency panel as specified.

C. All motor starters for HVAC equipment shall be furnished under Division 15 to be mounted under this Division if not factory mounted on equipment.

D. All duct mounted smoke detectors required for HVAC equipment shall be furnished under this Division with contacts as required for HVAC fan shut down. Installation of duct mounted detectors shall be by Division 15.

E. Coordinate voltage and rough-in requirements of all HVAC equipment with Division 15 contractor prior to installation.

## 3.6 MOTOR WIRING:

A. Motor sizes indicated on plans are approximate and are subject to change to suit standard motor drives of various manufacturers. The Contractor shall be responsible for checking characteristics of motors to be installed and provide wiring and devices of proper size for these motors.

## 3.7 OWNER FURNISHED EQUIPMENT CONNECTIONS:

A. Furnish and install all necessary outlets, disconnects, wiring and connections for Owner furnished equipment and its control as required. Locations of stub-ups on drawings for said equipment are approximate. Exact locations shall be as instructed by the Owner and equipment supplier.

B. All equipment shall be set in place ready for electrical connection.

## 3.8 WIRING DEVICE TESTING:

A. Prior to final acceptance, check all wiring devices for proper wiring connections with "outlet" wiring test device. All outlet wiring deficiencies shall be corrected prior to final inspection. Submit letter of certification on proper operation and wiring of devices.

**END OF SECTION**

# SECTION 16100
# ELECTRICAL OBSERVATIONS

## PART 1 - GENERAL

### 1.1 REQUIREMENTS:

A. The work under this section of the work is subject to the provisions of the General Conditions, Supplementary Conditions and Division 1 - General Requirements, all of which are hereby incorporated herein and by this reference made a part thereof.

B. The Contractor shall be governed by all of the provisions of the aforementioned Contract Documents and all other Contract Documents of which in any way affect the work herein specified.

### 1.2 WORK INCLUDED:

A. Work under this project will be subject to observation by Architect, Engineer and local building officials. This section lists minimum requirements that engineer will use for observation of all projects.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

A. All products for this project shall be as specified in other sections of Division 16 Specifications.

B. All products shall be new and shall be UL labeled where available.

C. All products installed shall match product types and manufacturer of materials submitted and approved in shop drawings.

D. Contractor shall have copy of approved shop drawings on site at time of final observation.

## PART 3 - EXECUTION

### 3.1 MINIMUM REQUIREMENTS:

A. The following items shall be reviewed during electrical observations:

1. Underground conduit installed at proper burial depth.
2. Warning tape installed in electrical trenches. Extend ends of tape above ground at end for inspecting.
3. Rigid elbows used where conduit turns up through concrete slabs, and from bottom of ditches to above grade.
4. Electric service grounded to building steel, metal water pipe, concrete encased electrode and ground counter poise when specified.
5. Electric service conduits, switchboards, equipment enclosures and raceways properly grounded and bonded.
6. All electrical equipment panels, switchboards, transformers, generators etc., bolted to walls and floor. Proper code working clearance provided in front of all electrical equipment.
7. Secondary of all transformers grounded per item 4 above.
8. All wiring properly color coded at panels and switchboards by voltage and phase.
9. Conduit fill as observed at panelboards does not exceed specifications and code requirements. Ground conductors observed in all conduits.
10. Panelboard interiors cleaned of all construction debris. Proper grounding and bonding bushing installed. All unused conduit openings plugged. Panel directories typed

indicating loads served. Panel nameplates installed with screws. Nameplates indicate panel designation, voltage and phase.

11. All wiring systems of a type approved in specifications. Wiring systems properly supported at intervals per code.
12. All junction box covers properly installed, all unused knockouts closed and box covers marked with circuit numbers.
13. Fire alarm boxes and covers painted Red.
14. Temporary wiring and lighting systems above ceiling removed before final inspection.
15. Wiring devices of proper amp rating. Device plates of proper material. Tamper proof screws installed where specified.
16. Emergency lighting system functioning. Light fixture lamps installed and operating properly.
17. Fire alarm system installation complete and in normal operating mode without trouble conditions.
18. Trip devices in service main breakers set as directed by engineer and sealed closed.

## 3.2 SPECIFIC REQUIREMENTS:

A. In addition to general items listed above, items specific to this project will be observed for installation in accordance with plans, specifications and code.

**END OF SECTION**

# SECTION 16170
# GROUNDING AND BONDING

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010, General Provisions and Section 16050, Basic Materials and Methods shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work required under this section consists of grounding and bonding of electrical service, equipment and building.

### 1.3 REFERENCES:

A. All grounding and bonding shall be installed per Article 250 of the National Electric Code.

## PART 2 - PRODUCTS

### 2.1 GROUND RODS:

A. Ground rods shall be U.L listed, 5/8" by 10ft copper bonded ground rods with minimum 10mil copper plating thickness. Ground rods shall comply with NEC 250.52. Where additional ground rod length is required, rods shall have threaded ends and couplings.

### 2.2 GROUND BARS:

A. Ground bars shall be ¼" thick, 4" wide, 20" long with wall mounting brackets, insulators and pigtail. Provide ground bars in communication closets and where indicated. Ground bar shall be equal to Harger #GBIT-14420-A2T. Connect ground bar with #6 AWG ground conductor in ¾" conduit to building service entrance ground.

### 2.3 GROUND CONNECTIONS:

A. Ground connections shall be compression type or exothermic welded. Connections shall be UL467 listed and meet all IEEE 837 requirements. Connections below grade shall be listed for direct burial.

B. Compression connections shall be irreversible type as manufactured by Burndy or approved equal. Compression tool shall be hydraulic type that can not be opened until a complete compression has been made. Compression tool die shall permanently label the connector with die type and number.

## PART 3 - EXECUTION

### 3.1 GROUNDING:

A. The Utility service and each separately derived electric system (step down transformers and generators) shall be grounded in accordance with Article 250 of National Electric Code and all local code requirements.

B. The service grounding electrode system as required by Article 250-50 of National Electric Code must include all of the following connections where available:

1. Underground metal water pipe connection within 5 ft. of entrance to building.

2. Effectively grounded building steel structure or metal frame.
3. A 20 foot length of ½" diameter non-coated steel re-bar encased in 2" of concrete located near bottom of footing or foundation.
4. Delta ground triangulation.

C. Grounding of separately derived systems shall be the made to the nearest effectively grounded building steel column or metallic water pipe.

D. Building steel shall become effectively grounded by intentional bonding of building steel columns to 20 feet of non-coated steel re-bar encased in 2" of concrete located near bottom of footing or foundation. Building columns shall be effectively grounded every 100 feet of building perimeter and adjacent to electric service entrance.

## 3.2 BONDING:

A. Provide bonding for all electrical equipment enclosures, raceways, boxes and similar equipment according to Article 250-80 through 250-106.

B. Provide grounding bushing on all metallic conduits and equipment enclosures ahead of service disconnect.

C. Bond all interior metal piping systems to grounding electrode system.

D. Bond building steel structures that are supported by masonry or similar non-metallic walls to the grounding electrode system per Article 250-104 of NEC.

E. Grounding and bonding conductors shall be protected from physical damage with conduit. Use PVC conduit where allowed by Code for protection. Where metallic conduit is used, provide full size bonding conductors at each end of conduit as required by Code.

F. All ground connections shall have clean contact surfaces and shall be made with approved fittings.

G. Show all buried or concealed ground bonds on As-Built plans. Provide photo to the engineer of all buried or permanently concealed ground connections that have not been examined by the engineer.

H. Have red lined set of plans showing concealed ground locations available for the engineer at the time of final inspection.

I. Bond building steel structures and interior metal water piping system of new additions to existing building per Article 250-104 of NEC.

## 3.3 EQUIPMENT GROUNDING:

A. All circuits shall have insulated green grounding conductor sized per Article 250 of the NEC. Isolated ground conductors shall be green with orange stripe.

B. All flexible wiring systems shall be furnished with an internal insulated green grounding conductor.

C. Ground connections to painted or similar coated metals shall have all paint or coating removed between connector and metal. Use hex head machine bolts and nuts with flat and split ring lock washer or lug. Stove bolts are not acceptable.

D. Provide grounding bushing for all circuits over 240 volts, all circuits over 100 amps, all conduits entering eccentric or concentric knockouts, all conduits entering plastic or non-metallic enclosures, and all circuit serving isolated ground receptacles.

E. Equipment grounding conductors in branch circuits, feeders and service conduits shall be bonded together and to the metallic enclosures of all junction and pull boxes. This bonding shall include all switches and outlet boxes.

F. Sheet metal screws, "Tec" screws and equipment mounting bolts shall not be used for grounding or bonding. All grounding screws shall be green and shall be UL listed for equipment grounding.

**END OF SECTION**

# SECTION 16190
# SEISMIC RESTRAINT SYSTEMS

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010, General Provisions and Section 16050, Basic Materials and Methods shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work required under this section consists of furnishing and installing seismic restraint systems.

### 1.3 GENERAL:

A. All electrical equipment shall be seismically protected per International Building Code, Section 1613 Earthquake Loads. Seismic isolation shall be provided utilizing snubbers and/or neoprene mounting brackets with captive steel inserts.

B. The seismic design category for a structure is permitted to be defined in accordance with Section 1613 or ASCE 7. Site classification for seismic design shall be determined by the project Structural Engineer and shall be used for calculating electrical equipment support and attachment.

C. All isolators and isolation materials shall be of the same manufacture and shall be selected and certified using published or factory certified data.

D. All equipment requiring seismic restraint must include verifying calculations and analysis performed by a licensed professional engineer in the State of Arkansas. Products shall be of similar to those furnished by Mason Industries, Inc. as represented by Gorham/Shaffler in Memphis, TN, telephone number (901) 345-6100.

## PART 2 - PRODUCTS

### 2.1 PROTECTION DEVICES:

A. Devices shall be of manufacturer's latest design as required for equipment to be protected and shall include installation instructions.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

A. Except as otherwise indicated, seismic restraint shall comply with manufacturer's instructions for the installation and load application.

### 3.2 ELECTRICAL EQUIPMENT REQUIRING SEISMIC ISOLATION:

A. Furnish and install seismic isolation on all electrical equipment, conduit and lighting fixtures as required in ASCE 7.

B. Furnish seismic protection for the following equipment:

1. All panelboards and switchboard
2. Lighting fixtures

3. Transformers
4. Fire alarm control panel
5. Conduit systems

**3.3 FIXTURE SUPPORTS:**

A. All recessed lighting fixtures shall be independently supported at each corner from structure with hanger wires.

**3.4 SEISMIC BRACING:**

A. Contractor shall provide Seismic bracing details for all conduits supported with individual hangers exceeding 12" in length and for all conduits 2 ½" and larger. Contractor is referred to B-Line Seismic restraint catalog for multi-directional bracing of electrical conduit. Submit to building department a bracing design for each conduit and conduit rack configuration that contractor plans to install in project. Where rack configuration or installation method does not match a standard design, contractor shall have a structural engineer calculate and design bracing requirements.

**3.5 SEISMIC SUPPORT SUBMITTALS:**

A. Submittals including calculations and installation methods and products shall be kept on job site for reviewing by local inspectors.

**END OF SECTION**

# SECTION 16400
# SERVICE AND DISTRIBUTION

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010, Electrical - General Provisions, Section 16050, Basic Materials and Methods, shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work to be provided shall include furnishing and installing switchboards, panelboards, disconnects, transformers and associated distribution equipment.

## PART 2 - PRODUCTS

### 2.1 MAIN SWITCHBOARD:

A. Switchboard shall be rated 480Y/277 volts, 3 phase, 4 wire, 60 hertz. Switchboard shall be designed and tested per latest edition of NEMA PB-2 and UL-891 as manufactured by Siemens, Square "D" or Eaton.

B. Main circuit breaker shall be individually mounted stationary, non-drawout, manually operated. Main breaker compartment shall have barriers top, bottom, both sides and rear to isolate breaker from main bus. Main breakers shall have 9 function solid state trip devices with adjustable long-time, short-time, instantaneous and ground fault pick-up and delay setting. Trip device shall have clear, sealable cover and shall be visible from front of switchboard without removing switchboard covers. Trip devices that utilize an LED or LCD type display for viewing and setting trip characteristics must be furnished with an appropriate power supply to power the display. Displays that are powered by load on the circuit breaker or by batteries either integral or remote are not acceptable.

C. Switchboard bus shall be tin plated copper. RMS symmetrical short circuit current bracing shall be as noted on the drawings.

D. Branch circuit breakers shall be group mounted of the type and size scheduled on drawings.

E. Customer metering section shall include a solid state meter to monitor volts, amps, kilowatts, kilowatt hours, kilowatt amperes, power factor and maximum kW demand. Meter shall include an embedded Web server to access stored values with a lap top computer. Provide all necessary current and potential transformers. Meter shall be similar to Eaton PXM2250 or approved equal.

F. Breaker spaces shall have all bus bars, straps, braces, etc., necessary for accepting future breakers. Each breaker and space shall be provided with an engraved nameplate. A switchboard master nameplate listing system voltage, amperage and interrupting rating as shipped from the factory shall be provided. Nameplate shall state that all devices added in the future shall have a minimum interrupting rating equal to the value as shipped.

G. Provide arc flash protection warning signs in accordance with NEC 110.16.

H. All breakers shall have "Lock-off" provisions.

I. General Electric "Spectra Series" switchboards utilizing plug-in branch circuit devices will not be acceptable for this project.

J. Circuit breaker catalog number, trip rating, and interrupting rating shall be visible from front of switchboard without removing switchboard covers, or this information shall be provided on an engraved nameplate screwed to enclosure beside each circuit breaker.

K. Circuit breakers serving elevator motors/controllers shall be provided with adjustable instantaneous trip devices.

L. Provide surge protective device (SPD) Type 2 (transient voltage surge protection /surge arrestor) integral to main switchboard connected to the load side of the main breaker. SPD shall have a short circuit rating equal to or greater than the interrupting rating of the main breaker. Protection shall be nominally rated 240 kA per phase and 120 kA neutral to ground. Units shall be UL 1283 and UL 1449 (3rd Edition) labeled. Protectors shall have a nominal discharge current of 20kA. Protection shall be provided with service disconnect integral overcurrent protection and surge counter.

M. Provide shunt trip coil in all switchboard main breakers and connect to remote power off break glass station located at normal fire department access to building. Break glass station may be omitted if switchboard is immediately adjacent to exterior door at grade.

N. Provide phase loss, phase unbalance protection for all mechanical (MP) panels. Protection shall include adjustable pickup and delay settings, normal, and trip indicating lights, test and system reset buttons. Provide capacitor trip device to insure adequate control power for operation of branch circuit breaker shunt trip devices. Provide engraved nameplate indicating which breakers have single phase protection. Include operating instruction detailing how system is reset and circuit breakers reclosed.

## 2.2 ARC ENERGY REDUCTION SYSTEMS:

A. All circuit breakers (switchboard, panelboard and free standing) rated 1200 amps and greater shall be furnished with an Arc Energy Reduction System in accordance with Article 240.87 of National Electric Code, 2014 Edition.

B. The switchgear manufacturer may furnish any one of the Arc Energy Reduction methods listed as acceptable by NEC. The manufacturer will be responsible for furnishing all materials and documentation required to meet the energy/reduction method. If calculations are required for protective device settings, all calculations and recommended settings shall be provided as part of the Arc Energy Reduction method.

C. If an arc flash energy reduction maintenance switch is provided, it shall be furnished with a local status indicator. The switch shall be furnished with a clear cover that shall close over the switch. The cover shall have padlock provisions so that it can be used as part of a lockout/tagout system.

D. Instructions for operation of the system shall be installed adjacent to the maintenance switch and indicating light. If an alternate method is utilized, an instructional nameplate shall be provided to indicate how Arc Energy Reduction is accomplished.

E. When an energy reduction maintenance system is provided, the manufacturer shall be responsible for recommending the normal and maintenance mode trip settings for these breakers. The manufacturer shall provide coordination curves for each breaker for both normal and maintenance mode along with a calculation of downstream incident energy for both modes. A complete coordination and arc flash study isn't required unless specifically listed in another section of the specifications.

## 2.3 COORDINATION STUDY:

A. The switchgear manufacturer shall provide a coordination study in sufficient detail to recommend trip settings for all adjustable circuit breaker utilized throughout the electric system.

B. Manufacturer shall provide time current curves to document the recommended trip settings.

C. Switchgear manufacturer's service representative shall set all adjustable trip devices as recommended by the coordination study prior to the Owner occupying the building.

## 2.4 PREFABRICATED LIGHTING AND OUTLET PANELBOARDS:

A. Furnish and install Square "D", Siemens or Eaton panelboards of the size and type scheduled on the drawings. Panelboards shall be designed for 208Y/120 volt, 3 phase, 4 wire, 480Y/277 volt, 3 phase, 4 wire or 480 volt 3 phase, 3 wire service as scheduled on drawings.

B. All panelboards shall be furnished complete with full height locking door with padlock hasp and interior dead front trim. Panel front shall be hinged to panel can. Multi section panels shall be furnished with identical size cans for all sections.

C. All panelboards shall be fully rated for interrupting rating listed on drawings.

D. Panelboard circuit breakers shall bolt to panel bus and shall be of the quantity and rating listed on drawings. All circuit breakers shall be UL listed for 75 degree C. wiring systems.

E. All panelboards shall be furnished with copper bus including neutral and ground bus. Provide oversized neutral and isolated ground busses as noted on drawings.

F. Provide "On- Position" handle locks on all circuit breakers serving fire alarm panels, lighting control panels, telephone, security and battery operated emergency lighting circuits.

G. Panelboards shall be furnished with engraved nameplates indicating type of service, i.e. (Black with white lettering for normal service, red with white lettering for emergency service). Nameplates shall be attached to panel trim with screws. Nameplates shall indicate panelboard name, voltage, phase, and minimum interrupting rating as shipped from factory.

H. Circuit breakers serving elevator motors/controllers shall be provided with adjustable instantaneous trip devices

I. Provide arc flash protection warning signs in accordance with NEC 110.16.

J. Panelboards shall be provided with typewritten circuit directories. Directories shall indicate room number and load served by each circuit. Room numbers shall match room numbering system installed by Owner, not room numbers indicated on drawings. Panels shall have permanent readily visible numbers for all breakers and spaces.

K. Circuit breakers shall be installed in panels in locations shown on panel schedules. In addition to typewritten circuit directory listed above, install copy of the drawing panel schedule in a clear pocket inside each panelboard door.

L. Provide surge protective device (SPD) Type 2 (transient voltage surge protection /surge arrestor) integral to panelboard direct connected to the panel bus. SPD shall have a short circuit rating equal to or greater than the interrupting rating of the main breaker. Protection shall be nominally rated 160 kA per phase and 80 kA neutral to ground. Units shall be UL 1283 and UL 1449 (3rd Edition) labeled. Protectors shall have a nominal discharge current of 10kA. Protection shall be provided with integral overcurrent protection and surge counter.

## 2.5 MANUAL MOTOR STARTERS:

A. Furnish and install on all fractional horsepower fans manual motor starters of the NEMA type required, similar to General Electric Form CR101Y or approved equal. Furnish overload heaters for all motor switches sized per motor nameplate full load amps.

## 2.6 SAFETY SWITCHES:

A. Safety switches shall be heavy duty, NEMA type "HD" fusible or nonfusible as indicated. Switch mechanism shall be quick-make, quick-break. Cover shall be interlocked with mechanism to prevent opening unless switch is on the "OFF" position. Switches mounted outdoors shall have NEMA 3R enclosures. All switches shall be furnished with rejection type fuse clips for Class RK fuses, ground lug and engraved Micarta nameplates. Switches shall be Square "D" or approved equal.

## 2.7 FUSES:

A. Furnish and install all fuses for equipment as noted on drawings.

B. Fuses where indicated on the contract shall be dual element, of the size and type scheduled on the drawings, similar to Bussmann type LPN/LPS and as noted.

C. Fuses sizes for air conditioning equipment shall be sized according to equipment nameplate requirements.

## 2.8 SPARE FUSES:

A. Furnish to Owner at completion of project ten (10) percent spare fuses with no less than three fuses of any one type of ampere rating. Fuses shall be stored in a wall mounted fuse cabinet.

## 2.9 SPARE FUSE CABINETS:

A. Furnish adjacent to main switchboards, a spare fuse cabinet with lock and key and store spare fuses at completion of project.

## 2.10 DRY TYPE TRANSFORMERS:

A. Transformers shall be ventilated dry type with Class H insulation. Transformer shall be rated 480 volt to 208Y/120 volts, 3 phase, 4 wire as indicated on drawings. Transformer KVA ratings shall be as detailed on drawings. Transformers 15 KVA and larger shall be furnished with taps two (2) 2-1/2% F.C.A.B. and four (4) 2-1/2% F.C.B.N.

B. Transformers shall be mounted on vibration isolators. Conduit connections to transformers shall be made with neoprene jacketed flexible conduit.

C. Transformers shall be energy efficient type compliant with DOE Final Rule U.S. 10 CFR Part 431/APR 2013.

D. All transformers shall be floor mounted and shall be set on 4" high concrete pads.

E. Secondary neutrals of all transformers shall be grounded per Article #250 of NEC. Grounding electrode conductor shall be installed in conduit for its entire length.

F. Transformers shall be as manufactured by Square "D", Siemens, Eaton or approved equal.

G. Transformers shall be K13 rated where indicated on Contract Drawings.

## 2.11 CONTACTORS AND RELAYS:

A. Furnish and install contactors, relays and remote control switches as specified and indicated on drawings for control of lighting systems. Contactors shall be furnished in NEMA 1 enclosures with H-O-A switch on front cover and have sufficient contact quantities and ratings as required. Contactors shall be 600 volt electrically held, fully rated or mechanically held with clearing contacts as indicated on the drawings.

## 2.12 MARKING TAPE:

A. All underground ductlines conduits, ground conductors etc. shall be marked with marking tape inserted in trench 24 inches above top of ductline and a minimum of 12 inches below grade. Tape shall be as manufactured by Allen Systems, Inc. or approved equal labeled "Caution - Buried Electric Lines Below".

## 2.13 VARIABLE DEPTH PULL BOXES:

A. Furnish and install where indicated on drawings, variable depth pull boxes. Pull boxes shall be furnished with locking steel cover with logo "ELECTRIC" or "COMMUNICATIONS" as required. Boxes shall be Quazite PG series polymer concrete reinforced with heavy-weave fiberglass or approved equal. See drawings for catalog numbers.

B. Boxes shall be provided with extensions for depth to top of ductline. Top of box shall be set flush with finished grade. The pullbox shall be set to finished surface elevation on a prepared limestone base with a minimum depth of 8 inches. The surrounding backfill materials shall be placed prior to settling the upper frame.

## 2.14 CABLE MANAGEMENT HANGERS:

A. Furnish and install on both sides of corridors, cable management hangers (J-Hooks). Hangers are provided on 4' centers to provide support for data, video and EMS cables.

B. Hangers shall be constructed as detailed on the drawings and fastened to wall with expansion anchors.

# PART 3 - EXECUTION

## 3.1 INSTALLATION:

A. Switchgear shall be installed as per switchgear manufacturer's recommendations and as required by the National Electrical Code.

B. All electrical equipment shall be installed with vertical and horizontal clearance per NEC Articles 110 and 408. Plumbing, ductwork and other non-electrical equipment shall not be installed within the spaces dedicated to electrical equipment.

C. All circuit breakers and similar disconnect devices shall be installed so that operating handle is not more than 6'-7" above floor.

D. Internal parts of electrical equipment, including busbars, wiring terminals, insulators and other surfaces, shall not be damaged or contaminated by foreign materials such as paint, plaster, cleaners or corrosive residues.

E. Provide adjacent to main service disconnect a oneline diagram of complete electrical distribution system including circuit breaker and feeder sizes. Provide laminated plastic finish over oneline diagram. (See Section 16010).

F. Panelboards and equipment in finished spaces shall be field painted by another Division. Electrical Contractor shall be responsible for masking all nameplates and labels and closing all openings prior to painting.

G. Contractor shall field test ground fault protection on main switchboard by equipment manufacturer's recommendations and as required by Article 230-95 of National Electric Code. Include a copy of certified test in Operating and Maintenance Manual.

H. Conduit entering switchboards must enter switchboard section where overcurrent device is located. Under no circumstances shall feeder circuits occupy same compartment as service conductors.

I. See specification section 16010 for submittal requirements when furnishing products other than specified.

J. All flush mounted panels shall be furnished with one spare ¾" open conduit stubbed above ceiling for every 3 spare breakers or spaces for future. A minimum of 3 – ¾" spare conduits shall be provided for each panel.

## 3.2 EQUIPMENT SUPPORT:

A. All electrical equipment shall be properly attached to building structure with seismically designed attachment as detailed in specification section 16190.

**END OF SECTION**

# SECTION 16500
# LIGHTING AND LIGHTING CONTROL

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010, General Provisions and Section 16050, Basic Materials and Methods shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work required under this section consists of furnishing and installing lighting fixtures and items for control of lights as indicated on drawings and described herein.

## PART 2 - PRODUCTS

### 2.1 LIGHTING FIXTURES:

A. General: Furnish and install complete in all respects all lighting fixtures and lamps as listed in the Fixture Schedule and/or as specified hereinafter.

B. Lamps: Lamps shall be as described and scheduled in the Fixture Schedule. All incandescent lamps shall be 130 volt.

### 2.2 LED LIGHT FIXTURES:

A. LED light fixtures shall be in accordance with IES, NFPA, UL, as shown on the drawings, and as specified. Fixtures shall be UL listed.

B. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.

C. LED drivers shall include the following features unless otherwise indicated:

1. Minimum efficiency: 85% at full load.
2. Minimum Operating Ambient Temperature: -20° C. (-4° F.)
3. Input Voltage: 120 - 277V (±10%) at 60 Hz.
4. Integral short circuit, open circuit, and overload protection.
5. Power Factor: ≥ 0.95.
6. Total Harmonic Distortion: ≤ 20%.
7. Comply with FCC 47 CFR Part 15.

D. LED modules shall include the following features unless otherwise indicated:

1. Comply with IES LM-79 and LM-80 requirements.
2. Minimum CRI 80 and color temperature 3000° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
3. Minimum Rated Life: 50,000 hours per IES L70.
4. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.

E. LED Downlights:

1. Housing, LED driver, and LED module shall be products of the same manufacturer.

F. LED Troffers:

1. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.
2. Housing, LED driver, and LED module shall be products of the same manufacturer.
3. All LED Fixtures shall have a full 5 year warranty.

G. LED Compatible Dimmers:

1. Provide wall box dimmer where noted on drawings and as recommended by fixture manufacturer for compatibility with fixture type. Dimmers shall have adjustable slider with manual push button override.
2. Dimmer to be rated for a minimum of 4 times connected load and as recommended by manufacturer for fixture load inrush protection.
3. Dimmer shall be lead/lag type as required by specific fixture driver characteristics. Modify wiring indicated on drawings as necessary for specific dimmer and driver requirements.
4. Dimmer schedule to be included in submittals indicating specific fixture types to be controlled.
5. Where multiple dimmers are installed in a single location, provide engraved nameplates indicating dimmer function.

H. All LED arrays, drivers and all integral controls shall have 5 year warranty with a fixture replacement.

I. Battery packs when specified shall be nominal 1400 lumens initial and minimum of 1000 lumens at end of 90 minute battery operating period.

## 2.3 EXTERIOR LIGHTING SYSTEM:

A. Furnish and install exterior lighting systems as detailed and specified on the Contract Drawings complete with luminaires, poles, pole base fusing and 10' copper clad ground rod.

B. All anchor base poles shall be furnished with anchor bolt caps.

## 2.4 EXTERIOR LIGHTING POLE BASE FUSING:

A. Furnish and install in exterior lighting pole bases inline weatherproof fuse holders similar to Bussmann HEB with KTK fuse sized at 3 times full load current of fixtures fed by fuse and rubber insulating boot. See Section 16010 submittal requirements for alternate site lighting fixture submittals.

## 2.5 DIMMERS:

A. Furnish and install wall box dimmer systems of the ratings noted on contract drawings. Dimmers shall be rocker switch on/off actuated.

B. Dimmers shall be mounted with all fins attached so as not to require any dimmer de-rating.

# PART 3 - EXECUTION

## 3.1 LIGHTING FIXTURES:

A. Provide all steel straps, hangers, mounting rings and accessories required for installation of lighting fixtures.

B. Verify ceiling types prior to ordering fixtures to insure proper flanges, mounting arrangements, etc. Furnish proper ceiling slope adapters and ceiling thickness adapters as required.

C. At completion of project, clean all fixtures, lenses and interiors, removing all construction debris and accumulated dust. Replace all damaged lenses, louvers and fixture trims. If light fixtures are used for construction lighting, all lamps shall be replaced with new lamps at time of final inspection.

D. Fixtures installed in hard ceilings must be UL listed for access from below. Light fixtures installed outdoors shall have appropriate damp or wet location listing.

E. Fixtures weighing 50 pounds or more shall not be supported from outlet box or ceiling grid system. These fixtures shall be independently supported from structure above.

F. Lay-in fixtures in grid type ceiling systems shall be independently supported at four corners.

G. All light fixtures installed in fire rated ceiling shall have fire rated label. Review all plans and specifications for fire rating requirements.

H. All recessed light fixtures installed in direct contact with insulation systems shall be UL listed for this application and shall be thermally protected per Article 410 of NEC.

**END OF SECTION**

# SECTION 16501
# NETWORKED LIGHTING CONTROL SYSTEM

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010, Electrical - General Provisions, Section 16050, Basic Materials and Methods, shall be a part of this section.

C. Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.

### 1.2 WORK INCLUDED:

A. Work required under this section shall consist of furnishing and installing custom lighting control system including all system components and all necessary conduit, wire junction boxes, electrical service connections to lighting with connections to control panel(s).

B. Install lighting control panel where indicated on the plans and make electrical service connections as detailed. In addition to power connections, furnish and install control stations where indicated on the plans.

C. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational lighting control system, as described herein.

D. Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

E. The intent of these specifications is to provide a complete, functional, distributed intelligent, networked lighting control system for the control of incandescent, low-voltage, neon, cold cathode, LED, fluorescent and HID lighting sources.

F. Where shown on the drawings, the contractor shall furnish and install a complete low-voltage networked lighting control system consisting of, but not limited to, relays, controllers, enclosures, switch stations, photo sensors, occupancy sensors and miscellaneous components as required for a complete, operable lighting control system.

G. Where applicable standards have been established, all items of equipment, individual components and installation methods shall meet the requirements of these standards, including, but not limited to, Underwriter Laboratories (UL), the National Electrical Code (NEC), Federal Communications Commission (FCC) and any local or state codes that may be applicable.

H. In case of substitutions of equipment other than that specified herein the proposed manufacturer shall submit to the specifying engineer a line-by-line compliance comparison between each specification requirement and the system being proposed.

### 1.3 QUALITY ASSURANCE:

A. Factory Assembly: All relays, controllers, enclosures, switch stations, photo sensors, occupancy sensors and miscellaneous components shall be factory assembled and tested. All system components shall arrive at the job site completely pre-wired and ready for installation, requiring only the connection of lighting circuits and network terminations. All connections shall be made to

clearly and permanently labeled termination points. Systems that require field assembly shall not be acceptable.

B. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.

C. NEC Compliance: All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.

D. NEMA Compliance: All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.

E. UL Approval: All applicable equipment shall be tested to and listed under UL standard 508 and shall bare labels to indicate compliance. Lighting control relays shall be tested to UL standard 508 for both safety and endurance. System listed other ETL or other UL sections shall provide documentation proving compliance with UL standard 508.

F. FCC Emissions: All applicable equipment shall comply with FCC emissions standards specified in Part 15, sub-part j for commercial and residential applications and shall bear labels indicating compliance testing. Equipment the does not meet these standards shall not be acceptable.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

A. Furnish and install a complete lighting control system consisting of the following:

B. Lighting control system shall be furnished and installed by Contractor. This equipment includes the control panels, occupancy sensors, day-lighting controls, and the lighting remote and master control wall stations. It also includes the service feeders, load wiring, low voltage control wiring and the complete raceway system as required.

C. Factory installation schematics and start-up.

D. Four (4) hour instructional seminar.

E. System descriptions and Catalog number are those of Wattstopper Inc. Provide Wattstopper system or approved equal unless noted differently.

### 2.2 LIGHTING CONTROL PANELS:

A. Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:

1. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 – 8 relays, 1 – 24 relays and 6 four-pole contactors, or 1 – 48 relays and 6 four-pole contactors.
2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:
   a. Removable, plug-in terminal blocks with screwless connections for all low voltage terminations.

b. Individual terminal block, override pushbutton, and LED status light for each relay.

c. Direct wired switch inputs associated with each relay and group channel shall support two- or three-wire, momentary or maintained contact switches or 24VDC input from occupancy sensors.

d. Automatic support for occupancy sensor sequence of operation. Direct wired low voltage inputs automatically reconfigure when connected to a WattStopper occupancy sensor head. Occupancy sensor shall switch lighting on and off during unoccupied periods but shall not turn lighting off during scheduled occupancy periods.

e. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches and digital occupancy sensors.

f. Isolated contacts within each relay shall provide true relay state to the electronics. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems.

g. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.

h. Group, channel, and pattern control of relays shall be provided through a simple keypad interface within the panel. Any group of relays can be associated with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override pushbuttons and LED displays.

i. Relay group status for each channel shall be provided through bi-color operation of the LED indicators. Solid red indicates that all relays in the group are on, solid green indicates that the group is in a mixed state, and blinking green indicates that the relays have blink warned and are currently timing out.

j. Each relay and channel terminal block shall provide a 24V pilot light signal. It shall be possible to configure the system for support for any Class 2 pilot light voltage with the use of an auxiliary power supply.

k. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:

(1) Electrical:
- (a) 20 amp ballast at 277V
- (b) 20 amp ballast at 347V
- (c) 20 amp tungsten at 120V
- (d) 20 amp resistive at 347V
- (e) 1.5 HP motor at 120V
- (f) 14,000 amp short circuit current rating (SCCR) at 347V

(2) Mechanical:
- (a) Individually replaceable, ½" KO mounting with removable Class 2 wire harness.
- (b) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
- (c) Dual line and load terminals each support two #14 – #12 solid or stranded conductors.
- (d) Tested to 300,000 mechanical on/off cycles.

(3) Isolated low voltage contacts provide for true relay status feedback and pilot light indication.

4. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

5. Lighting control panels shall be WattStopper model LMCP8, LMCP24 or LMCP48 as shown on the plans.

## 2.3 USER INTERFACE:

A. Each lighting control panel shall be supplied with an integral user interface consisting of a keypad and associated OLED display screen. The user interface shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following functions as a minimum:

1. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
2. Enter meaningful names for the panel, relays, and channels.
3. View normal hours/after hours status of each channel.
4. Override the normal hours/after hours mode for each channel.
5. View the 16 priority array slots for each channel and relay.
6. Program the schedule response for each channel as:
   a. Automatic-on or manual-on.
   b. Enable/disable blink warn.
   c. Enter override time delay as 0 (none) to 240 minutes.

## 2.4 SCHEDULE, GROUP, AND PHOTOCELL CONTROL OF RELAYS:

A. The lighting control panel shall support schedule, group, and photocell control functions via the network as configured in the optional Segment Manager controller or building automation system. The lighting control panel shall be fully compatible with building automation systems that are BACnet compliant. See related specification sections for additional information on interfacing the lighting control panel(s) to the building automation system.

## 2.5 BROWSER-BASED PROGRAMMING AND CONTROL:

A. The digital segment manager shall be a compact controller capable of hosting the schedule, photocell, and group relay control functions for a network of up to 96 LILM series lighting control panels. The segment manager shall provide the following features:

1. Provision for 1 to 3 separate network segments to facilitate efficient network wire routing.
2. Compact housing with screw tab mounts for surface installation and integral DIN rail mounting slot for NEMA 1 installation in the LMSM-ENC1 enclosure.
3. Web browser-based user interface; shall not require the installation of any lighting control software.
4. User interface accessible form most smart phone browsers when Internet connected.
5. Login security access control restricting some users to view-only or other limited operations.
6. Automatic discovery of the lighting control panels.
7. Familiar navigation-tree-based browsing to individual lighting control panels.
8. View/override current status of channels and relays.
9. Assign relays to channels.
10. Set channel operating parameters:
    a. Automatic-on or manual-on operation.
    b. Enable/disable blink warn.
    c. Override duration time, 0 (none) to 240 minutes.
    d. AS-100 automatic wall switch operation mode.
11. Create and run schedules:
    a. Normal hours/after hours schedules for channels.
    b. On/off schedules for relays.
    c. Support for a minimum of 100 unique schedules, each with up to four time events per day.
    d. Support annual schedules, holiday schedules and unique date-bound schedules.
12. Ethernet connectivity for user access via direct-wired connection, LAN/WAN, or Internet connection.

13. BACnet IP connectivity for connection to building automation systems.
14. Segment manager shall be WattStopper LMSM-201 with one network segment or LMSM-603 with support for three network segments.

**2.6 SINGLE / DUAL RELAY WALL SWITCH OCCUPANCY SENSORS:** See lighting control legend on drawings for model number and specifications.

**2.7 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM:**

A. Wall or ceiling mounted (to suit installation) dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:

1. Digital calibration and pushbutton programming for the following variables:
   a. Sensitivity – 0-100% in 10% increments
   b. Time delay – 1-30 minutes in 1 minute increments
   c. Test mode – Five second time delay
   d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
   e. Walk-through mode
   f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
2. One or two RJ-45 port(s) for connection to DLM local network.
3. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
4. Device Status LEDs including:
   a. PIR Detection
   b. Ultrasonic detection
   c. Configuration mode
   d. Load binding
5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
6. Manual override of controlled loads.

C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. WattStopper product numbers: LMDC

**2.8 DIGITAL WALL SWITCHES:**

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configuration; available in white, light almond, ivory, grey and black; compatible with wall plates with decorator opening. Wall switches shall include the following features:

1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
3. Red configuration LED on each switch that blinks to indicate data transmission.
4. Blue Load/Scene Status LED on each switch button with the following characteristics:

a. Bi-level LED
b. Dim locator level indicates power to switch
c. Bright status level indicates that load or scene is active

5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.

B. Two RJ-45 ports for connection to DLM local network.

C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.

D. The following switch attributes may be changed or selected using a wireless configuration tool:
1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
2. Individual button function may be configured to Toggle, On only or Off only.
3. Individual scenes may be locked to prevent unauthorized change.
4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
5. Ramp rate may be adjusted for each dimmer switch.
6. Switch buttons may be bound to any load on a room controller and are not load type dependant; each button may be bound to multiple loads.

E. WattStopper product numbers: LMSW Series.

## 2.9 ROOM CONTROLLERS:

A. Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
3. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status
4. Quick installation features including:
   a. Standard junction box mounting
   b. Quick low voltage connections using standard RJ-45 patch cable
5. Plenum rated
6. Manual override and LED indication for each load
7. Dual voltage (120/277 VAC, 60 Hz)
8. Zero cross circuitry for each load.

B. On/Off Room Controllers shall include:

1. One or two relay configuration
2. Efficient 150 mA switching power supply
3. Three RJ-45 DLM local network ports
4. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.

a. One relay configuration only
b. Automatic-ON/OFF configuration

5. WattStopper product numbers: LMRC-101, LMRC-102, LMPL-101

C. On/Off/Dimming enhanced Room Controllers shall include:

1. Real time current monitoring
2. One, two or three relay configuration
3. Efficient 250 mA switching power supply
4. Four RJ-45 DLM local network ports.
5. One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers.
6. Optional Network Bridge for BACnet MS/TP communications (LMRC-3xx).
7. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100%
   b. Set high and low trim for each load
   c. Set lamp burn in time for each load up to 100 hours
8. Discrete model listed for connection to receptacles, for occupancy-based control of plug loads within the space.
   a. One relay configuration only
   b. Automatic-ON/OFF configuration
9. WattStopper product numbers: LMRC Series.

## 2.10 DIGITAL PHOTOSENSORS:

A. Digital photosensors work with room controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to a room controller. Closed loop photosensors measure the ambient light in the space and control a single lighting zone. Open loop photosensors measure incoming daylight in the space, and are capable of controlling up to three lighting zones. Photosensors shall be interchangeable without the need for rewiring.

B. Digital photosensors include the following features:

1. An internal photodiode that measures only within the visible spectrum, and has a response curve that closely matches the photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-10,000 footcandles (fc).
3. The capability of switching one-third, one-half or all lighting ON and OFF, or raising or lowering lighting levels, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a deadband or a separation between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling after they turn off.
5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a user-selectable minimum level.
6. Optional programmable wall switch override to allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise and lower lighting levels for a selected period of time or cycle of occupancy.
7. Infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.
8. Red configuration LED that blinks to indicate data transmission.
9. Blue status LED indicates test mode, override mode and load binding.
10. Recessed switch to turn controlled load(s) ON and OFF.
11. One RJ-45 port for connection to DLM local network.

12. An adjustable head and a mounting bracket to accommodate multiple mounting methods and building materials. The photosensor may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox.

C. Closed loop digital photosensors include the following additional features:

1. An internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from bright sources outside of this cone.
2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
3. Automatically establishes setpoints following self-calibration.
4. A sliding setpoint control algorithm for dimming daylight harvesting with a "Day Setpoint" and the "Night Setpoint" to prevent the lights from cycling.
5. WattStopper Product Number: LMLS-400.

D. Open loop digital photosensors include the following additional features:

1. An internal photodiode that measures light in a 60 degree angle cutting off the unwanted light from the interior of the room.
2. Automatically establishes setpoints following calibration using a wireless configuration tool or a PC with appropriate software.
3. A proportional control algorithm for dimming daylight harvesting with a "Setpoint" to be maintained during operation.
4. WattStopper Product Number: LMLS-500.

## 2.11 ROOM NETWORK (DLM Local Network):

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building. Digital room devices connect to the network using Plenum rated CAT 5e cables with RJ-45 connectors which provide both data and power to room devices. Features of the DLM local network include:

1. Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

## 2.12 CONFIGURATIONS TOOLS:

A. A configuration tool facilitates optional customization of DLM local networks, and is used to set up open loop daylighting sensors. A wireless configuration tool features infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include:

1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
3. Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.

4. Save up to nine occupancy sensor setting profiles, and apply profiles to selected sensors.
5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting.
6. Adjust or fine-tune daylighting settings established during auto-commissioning and input light level data to complete commissioning of open loop daylighting controls.

C. WattStopper Product Numbers: LMCT-100, LMCI-100/LMCS-100.

## 2.13 NETWORK BRIDGE:

A. The network bridge connects a DLM local network to a BACnet-compliant network for communication between rooms, panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication.

1. The network bridge may be incorporated directly into the room controller hardware (LMRC-3xx Room Controllers) or be provided as a separate module connected on the local network through an available RJ-45 port.
2. Provide Plug n' Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
3. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects shall be provided as follows:
   a. Read/write the normal or after hours schedule state for the room
   b. Read the detection state of the occupancy sensor
   c. Read/write the On/Off state of loads
   d. Read/write the dimmed light level of loads
   e. Read the button states of switches
   f. Read total current in amps, and total power in watts through the room controller
   g. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
   h. Activate a preset scene for the room
   i. Read/write daylight sensor fade time and say and night setpoints
   j. Read the current light level, in footcandles, from interior and exterior photosensors and photocells
   k. Set daylight sensor operating mode
   l. Read/write wall switch lock status
4. WattStopper product numbers: LMBC-300

## 2.14 SEGMENT MANAGER:

A. The Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser. Each segment manager shall have support for one, two or three segment networks as required and allow for control of a maximum of 127 local networks (rooms) and/or lighting control panels per segment network.

B. Operational features of the Segment Manager shall include the following:

1. Connection to PC or LAN via standard Ethernet TCP/IP.
2. Easy to learn and use graphical user interface, compatible with Internet Explorer 8 or equal browser.
3. Log in security capable of restricting some users to view-only or other limited operations.
4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function shall not be required.

5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation.
7. Ability to set up schedules for rooms and panels. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation.
8. Ability to group rooms and loads for common control by schedules, switches or network commands.
9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
10. Provide seamless integration with the BAS via BACnet IP

C. WattStopper Product Numbers: LMSM-3E, LMSM-6E.

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

A. When using wire for connections other than the DLM local network Plenum rated (Cat 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements.

B. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.

C. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

1. Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.

D. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
3. Load Parameters (e.g. blink warning, etc.)

E. Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

**3.2 FACTORY COMMISSIONING:**

A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.

B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.

C. Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.

**3.3 WARRANTY:**

A. Provide a five year complete manufacturer's warranty on all products to be free of manufacturers' defects.

**3.4 MAINTENANCE:**

A. Spare Parts:

1. Provide 5% of each product to be used for maintenance.

**END OF SECTION**

# SECTION 16721
# FIRE ALARM SYSTEM

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010 - Electrical - General Provisions, Section 16050 - Basic Materials and Methods, shall be part of this section.

### 1.2 WORK INCLUDED:

A. Furnish and install complete, a new addressable type fire alarm system, including all necessary conduit, wire, system devices and equipment as detailed on plans and specified herein.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

A. Furnish and install a complete addressable type fire alarm system in compliance with ADA requirements as manufactured by Simplex True Alarm Series 4100ES, Edwards EST3, Siemens Cerberus-Pro or Gamewell/FCI 7100.

B. Actuation of any approved alarm initiating device shall automatically cause the following operations:

1. Visually indicate by English language readout of the zone in alarm on an LCD display on the front of the control panel.
2. Continuously sound all audible and flash all visual indicating devices until the system is silenced or restored to normal and reset.
3. Transmit signal to UL/FM central station
4. Shutdown Air Handling/Roof-top Units where required by code.
5. Illuminate the appropriate light on the annunciator.
6. Transmit slow whoop tone throughout facility. Transmit digitized voice message in areas of assembly.
7. Close all "hold open" doors.

C. General alarm devices may be silenced by authorized personnel only by entering a locked control cabinet and operating the proper silencing switch.

D. Provide system Walk Test for ease of equipment system testing and maintenance. Program shall actually identify the zone being tested over the indicating appliance circuits.

E. Modules shall be supervised against removal. Removal of a module shall activate a trouble condition.

F. System shall be capable of connecting Truealarm smoke density measuring devices having no self contained alarm set point (fixed threshold). The alarm decision for each sensor shall be determined by the control panel.

G. The panel shall have capability of maintaining a moving average of the sensors' smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. The system shall automatically maintain a constant smoke abscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors. The smoke obscuration sensitivity shall be adjustable to within 0.3% of either limit of the UL window (0.5% to 4.0%) to compensate for any environment.

H. The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value, a "DIRTY SENSOR" trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication to a second predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control panel for the individual sensor. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.

I. The control panel shall continuously perform an automatic self-test routine on each sensor which will functionally check sensor electronics and ensure the accuracy of the values being transmitted to the control panel. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition with the sensor location at the control panel.

J. An operator at the control panel, having a proper access level, shall be able to manually access the following information for each sensor:

1. primary status
2. device type
3. present average value
4. present sensitivity selected *
5. peak detection values *
6. sensor range (normal, dirty, etc.)

* Values shall be "percent of smoke obscuration" format so that no interpretation is required the operator.

K. System shall have sufficient capacity to handle all required I/O points plus 20% spare points for future expansion.

## 2.2 SYSTEM FEATURES:

A. The Fire Alarm System shall include the following features as a minimum:

1. Resound feature which allows resounding of audible devices in the event of a new zone in alarm.
2. Resound on trouble which allows resounding of the trouble sonalert when another trouble is indicated. Also provide a programmable trouble reminder initially set for 60 minutes. Every 60 minutes, the trouble sonalert will sound to remind the operator that a trouble condition exists.
3. Capable of supporting a combination of conventional hardwired and addressable zones in a single cabinet.
4. The system shall be microprocessor based, programmable and of modular construction. The system shall be programmable on site to accommodate project changes. Systems requiring changes to be made at a factory shall not be utilized. Full flexibility for selective input and output control based on ANDing, ORing, NOTing, timeing and special coded operations shall be incorporated in the resident software.
5. UL listed for NFPA A, B, C, D and Power Limited Applications per NEC 760.
6. Supervised Annunciator Outputs.
7. Provide a five minute Indicating Appliance circuit cut out to extend system operation on battery standby. After five minutes of alarm, the system will turn the evacuation signals off to conserve battery power should the fire have caused the 120 VAC supply to be shut off.
8. The historical log shall provide up to the last 300 alarms and 300 troubles in a data file for maintenance purposes. The system shall recall alarms and troubles in chronological order for the purpose of recreating an event history.

## 2.3 FIRE ALARM CONTROL PANEL:

A. Provide and install where shown, a main Fire Alarm Control Panel, complete with all modules, power supplies, stand-by batteries, and software for a complete and working system as shown on the plans and specified herein.

B. Provide non-volatile programmable memory within the control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

C. Provide transformers, fuses, auxiliary relays for central station, connection, HVAC unit shutdown and functions described to provide a working system as specified.

D. Provide batteries sized for 60 hours of standby with 5 minutes of alarm or as allowed by code.

E. Provide an addressable interface module for communicating with addressable devices over a single twisted pair and power wiring.

## 2.4 INITIATING DEVICES:

A. Addressable Manual Pull Stations shall be double action/push type, semi-flush mounted in a 2 gang switchbox with adapter plate. Station shall be equipped with key lock for resetting. All stations and control panels shall be keyed alike.

B. Furnish and install smoke detectors where shown on the plans:

1. Low profile adjustable sensitivity photoelectric type smoke detectors with applicable base or duct housing. The detector shall be listed to UL 268 and documented as compatible with the control equipment to which it is connected. The detector shall be provided with a 30-mesh insect screen and be completely shielded to protect against false alarms from EMI and RFI. The detector head shall be easily disassembled to facilitate cleaning. Detector bases shall include system addressing switches.
2. The Base shall provide an LED that locks on in alarm to provide quick and local identification of the detector in alarm for fire response personnel. Removal of the detector shall activate a trouble signal at main control panel.
3. Duct Mounted Detector Housing must be UL Listed for compatibility with and obtain its power from the fire alarm control panel. Removal of the smoke detector shall activate a trouble signal at the fire alarm control panel. Duct smoke detector trouble must be identified as required by NFPA 90A.
4. Where auxiliary contacts are required for local control functions actuated directly by the smoke detector, the detector should be configured as a four-wire device with separate power wiring to guarantee relay operation in the event of multiple detector activations. Furnish appropriate addressable relay bases or separate control modules near smoke detector for HVAC unit shut down.
5. Provide remote monitor/test panel for each duct detector with engraved nameplate indicating unit served.

C. Furnish and install heat detectors where shown on the plans:

1. Heat Detectors shall be addressable type and shall be capable of being installed in a standard smoke detector base.

D. Sprinkler System Devices: Provide fire alarm connections to all sprinkler system flow switches, tamper switches, post indicator valve switches, dry sprinkler system pressure switches and fire pump control and monitor points as required by Code and as directed by sprinkler contractor.

E. Install isolated loop circuit protector (Transient Suppression) on all circuits extending outside of building.

## 2.5 CONTROL DEVICES:

A. Furnish and install as shown on the plans, and as specified below, wall mounted audio/visual appliances with white lens, red "FIRE" lettering and Xenon flasher that complies with ADA requirements. Wire guards shall be provided on all fire alarm devices located in gymnasium areas.

B. Furnish and install as shown on the plans and specified below, wall mounted visual only units with Xenon flasher that complies with ADA. This unit shall mount in a single gang box and be red in finish and have in/out wiring to allow circuit supervision.

C. Furnish and install as shown on the plans magnetic door holders. Units shall be wall mounted with concealed wiring and powered by 24 VDC from the control panel. Door holders shall activate under alarm conditions only.

## 2.6 ANNUNCIATOR PANELS:

A. Install where shown on plans, and where specified below, remote LCD serial annunciator panels.

B. Each annunciator panel shall have switches or buttons for alarm silence, trouble silence and system reset. Provide a tone alert which duplicates the control panel tone alert during alarm and trouble conditions. A key switch shall be provided to activate and de-activate the control devices.

# PART 3 - EXECUTION

## 3.1 GENERAL:

A. All fire alarm systems and associated devices shall be furnished by a factory authorized supplier. All fire alarm devices shall be of the same manufacturer or shall be UL system listed for use with main control panel and all other components.

B. Equipment submitted for approval that is not of the same manufacturer shall be submitted with UL listing documentation to verify UL system listing.

C. Fire alarm system shall be installed by a licensed fire alarm contractor in accordance with all state and local requirements.

D. Contractor shall take out all necessary permits and pay all fees associated with fire alarm system.

## 3.2 INSTALLATION:

A. Fire alarm system shall be installed in accordance with manufacturer's recommendations using wiring diagram prepared by manufacturer showing in one line form all wiring and conduit requirements including power wiring.

B. Fire alarm system shall receive a final check in the presence of the Owner's representative to show proper operation of systems.

C. All system components shall be located as shown on the drawings or as may be otherwise directed by the Engineer.

D. Before connection to the central reporting agency is made, a complete Acceptance Test and Inspection of all related fire alarm devices will be performed in the presence of representatives of the local Fire Department. Furnish all labor and materials as required to conduct these tests.

E. All fire alarm wiring shall be installed in conduit. Wiring shall be of the size, type and rating as recommended by the fire alarm manufacturer. All communication circuit conductors shall be shielded. Where wiring is installed outside, (above or below grade) it shall be wet location rated similar West Penn Wire Aquaseal. Splices will not be allowed in any underground circuits. All

wiring shall meet the requirements of all national, state and local electrical codes. The sizes and color coding of wires shall be tagged at all junction points and shall test free of grounds or shorts between conductors. All wiring shall be as required by Article 760 of NEC.

F. Projects requiring communications of sub-feed panels and or transponders to a main building panel shall be connected with fiber optic cables. Fiber optic cable shall be of the type recommended by the fire alarm manufacturer. Fiber installed below grade or in wet locations shall be UL labeled for wet location use. Fiber optic cable shall be installed with out splices from end to end.

G. Final connections between equipment and the wiring system shall be made by a representative of the fire alarm manufacturer. This shall include all device terminations and cable splices. Fire alarm manufacturer shall be responsible for verifying and certifying that all devices have been installed, are properly terminated and operating correctly. In addition, fire alarm manufacturer shall certify that all surge protection devices are installed and properly grounded.

H. Provided dedicated 20 Amp, 120 volt control circuit to fire alarm main control panel and to each remote amplifier and power supply. Provide circuit breaker lock-on device for all fire alarm circuits.

I. Provide telephone connection to main control panel for system monitoring by central station.

J. Install automatic smoke detection in ceiling above fire alarm main control panel per NFPA-72.

K. Install fire alarm annunciator panel at grade level at the nearest point of fire department access. Coordinate annunciator panel location with fire marshal. When fire alarm control panel is not installed in a normally occupied location, another annunciator panel shall be installed in a normally occupied location where trouble signals can be monitored.

L. Install fire alarm visual appliances in accordance with NFPA and ADA requirements. Visual appliances in corridors must be installed within 15ft of the end of each corridor and not more than 100 feet apart. Visual appliances shall be rated 15 candela for corridors up to 20 feet in width. Visual appliances in corridors greater than 20 feet in width shall be rated 75 candela.

M. Install fire alarm visual appliance in all restrooms, and general usage areas like meeting rooms, conference rooms, breakrooms, hallways, lobbies and common use areas per ADA requirements. Strobe intensities, location and spacing shall be as required by NFPA-72 for a minimum 0.0375 lumens per square foot.

N. Where multiple visual appliances are installed in a single space, all strobes shall be synchronized to flash at the same time. Flash rate shall be in accordance with Code requirements.

O. Fire alarm pull stations shall be located within 5ft of exit door and shall be installed at 48" above finished floor.

**3. 3 INTELLIGIBILITY:**

A. Fire alarm supplier shall be responsible for determining proper quantity and rating of fire alarm speakers as required to meet intelligibility requirements of NFPA 72. The drawings indicate our best estimate of the quantity of devices that might be required.

B. Contractor shall be responsible for setting proper speaker wattage tap setting as direct by fire alarm supplier and as required by final fire department testing.

C. Amplifier quantities and wattages shall be as directed by the fire alarm supplier. Provide 25% spare amplifier capability to allow changes in speaker tap settings.

## 3.4 SUBMITTAL REVIEW:

A. Submittals shall include catalog cutsheets wiring diagrams, riser diagram, and floor plans showing all fire alarm devices. Floor plans shall show all components, conduit sizes, number of conductors and device addresses designations by components.

B. Contractor shall submit to local Fire Marshal complete data as required, (floor plans with device locations and wiring requirements, equipment description, etc.) and other information required for their review. Accomplish this review before submittals are furnished to Engineer and incorporate their comments.

C. Submittal data shall include dimensions of all cabinets and equipment with descriptive data necessary to fully describe all equipment specified.

## 3.5 HVAC INTERLOCK CONNECTIONS:

A. Furnish and install all necessary equipment interlocks and auxiliary contacts for fan shut-down as required under other divisions of this specification.

## 3.6 FIRE ALARM JUNCTION BOX SYSTEMS:

A. Junction boxes for fire alarm system conduit shall be painted "Fire Red" to differentiate conduit systems from normal or emergency power systems.

## 3.7 HVAC DUCT DETECTOR INSTALLATION:

A. Duct mounted smoke detectors and sampling tubes shall be installed in duct work of all RTU's, AHU's and at combination fire and smoke dampers by Division 15 Contractor. Locations shall be as required by NFPA 72E and as approved by the local Fire Department. Detectors shall be furnished to Division 15 including housings and sampling tubes for installation in duct work. Wire and conduit from smoke detector or control relays to unit control enclosure shall be by Division 16, final connection to control circuit shall be by Division 15.

## 3.8 SMOKE DAMPER INSTALLATION:

A. Smoke detectors controlling smoke dampers shall be provided with remote mounted indicator panels to be located in ceiling directly below damper or where indicated on the drawings. Provide 120 volt AC control circuit to each damper and install snap switch disconnect for local servicing and testing of damper.

## 3.9 SPRINKLER SYSTEM FIRE ALARM CONNECTIONS:

A. Fire alarm manufacturer shall coordinate with sprinkler contractor the quantity and location of all sprinkler system flow switches, tamper switches, solenoid valves, post-indicator valves and other devices that require monitoring.

B. Provide fire alarm connections to all dry sprinkler system flow switches, tamper switch and pressure switches as directed by sprinkler contractor and NFPA 13.

C. When fire pumps are specified, provide fire alarm connection to the pump controller to monitor 1) loss of power, 2) phase reversal and 3) pump running. Provide audible and visual indication of pump alarm conditions in a constantly attended location per NFPA 20.

D. Flow and tamper switch connections shall consist of a 4-inch square device box wall mounted near the switches. Connect switches to box with ½" weatherproof flexible conduit. Exterior mounted devices on post-indicator valves and in pits, etc., require weatherproof boxes and fittings for all wiring. Provide surge protection devices for all circuits outside of building.

## 3.10 MAGNETIC DOORHOLDER INSTALLATION:

A. Electric magnet portion of holder:

1. When mounted flush with dry wall or plaster wall, outlet box shall be securely mounted and/or bolted inside of wall.
2. When mounted flush with concrete/cinder block wall outlet box shall be held securely by filling void around box with mortar.
3. When surface mounted, the electro magnet shall be installed in weatherproof single gang box. This box shall be mounted securely by no smaller than 1/4" expansion bolts, 1/4" lead anchor and 1/4"-20 bolt, 1/4" toggle bolts, etc. Plastic anchors and sheet metal screws will not be approved or accepted.

B. Catch or non-electric part of doorholder unit:

1. This part shall be mounted by 1/4"-20 bolts through the door into the catch. No clips, brackets or sheet metal screws will be approved or accepted.
2. When the arc or swing of the door does not physically allow the catch and magnet to meet, the catch or magnet shall be mounted to a 6" wide bracket of 1/8" aluminum (dimensions of depth will vary with location). This bracket shall be furnished by contractor and shall be mounted to the wall or door by no less than 1/4"-20 bolts. No chains will be accepted to span the distance needed for the catch and magnet to meet.

C. Smoke detectors controlling hold open devices must be located in accordance with NFPA 72. Protection shall be provided on both sides of hold open device when shown on drawings.

## 3.11 FIRE ALARM CERTIFICATION:

A. Upon completion of the installation and Fire Marshal testing of fire alarm system, furnish system certification as required by NFPA 72, paragraph 2-2, "Documentation", sub-paragraphs 2-2.1 through 2-2.3. This paragraph covers the following general items on fire alarm system final approval documentation.

1. Approval/Acceptance
2. Certificate of Compliance
3. Owner's Manual
4. As-built drawings

## 3.12 SENSITIVITY TESTING:

A. All fire alarm smoke detectors shall be sensitivity tested per NFPA 72E and certification of testing submitted to Fire Department before their system testing.

## 3.13 RECORD (As Built) DRAWINGS:

A. Furnish in AutoCAD format, fire alarm system as-built drawings showing exact locations of Devices, conduit runs, and junction boxes, schematic diagram, riser diagram and termination cabinet schematic. Drawings shall be in accordance with Electrical Specifications Section 16010.

## 3.14 SPARE PARTS:

A. A completion of project, turn over to Owner 10% spare parts to include pull stations, heat detectors, smoke detectors, duct mounted smoke detectors, programmable control relay modules, audio/visual devices of each type, speakers, horns and similar devices.

B. Furnish one spare remote audio/visual power supply.

**END OF SECTION**

# SECTION 16727
# SECURITY SYSTEM

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010 - Electrical General Provision and 16050 - Basic Materials and Methods shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work included under this Section shall include furnishing and installing a rough-in conduit system for passive infrared and intrusion alarm system in the proposed building.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

A. Furnish and install complete rough-in conduit system in the proposed building for intrusion alarm system. Coordinate all rough-in requirements with Owner.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

A. Complete system rough-in shall be installed in accordance with manufacturer's recommendations and as required by Code. All conduit rough-in shall be coordinated with Owner's equipment supplier.

**END OF SECTION**

# SECTION 16781
# VOICE/DATA ROUGH-IN CONDUIT SYSTEMS

## PART 1 - GENERAL

### 1.1 REQUIREMENTS INCLUDED:

A. The General Documents form a part of this section.

B. Section 16010 - Electrical General Provision and 16050 - Basic Materials and Methods shall be a part of this section.

### 1.2 WORK INCLUDED:

A. Work required under this section shall consist of furnishing and installing an open voice/data conduit system for equipment and cable installation by others.

## PART 2 - PRODUCTS

### 2.1 GENERAL:

A. Conduit, fittings, hangers, boxes, device plates and other raceway system devices shall be as specified in section 16050.

## PART 3 - EXECUTION

### 3.1 GENERAL:

A. A complete and continuous metallic conduit system of 3/4" (minimum) diameter shall be furnished and installed from each telephone outlet location to ceiling plenum space of corridor and as noted.

B. Voice/data cable and equipment will be furnished and installed by others.

C. Conduits shall have pull strings.

D. Furnish painted (Gloss White), 3/4" thick exterior grade plywood backboards at equipment locations of the dimensions indicated on the drawings. Furnish and install #6 ground in 3/4" C to building grounding system from each equipment backboard. Leave 6 ft. of slack conductor at main telephone terminal to be terminated by TELCO.

E. Furnish and install telephone service entrance ductline to equipment room area from service location as instructed by TELCO.

**END OF SECTION**