



# PROJECT MANUAL

## **Building 51 – Tenant Upgrade** Roanoke, Virginia

Prepared for  
**Roanoke Regional Airport Commission**

T&L Project No. 12813  
RRAC Bid No. 20-004  
Issued for Bids January 5, 2020



**THOMPSON  
& LITTON** EST.  
1956



**SPECIFICATIONS FOR  
ROANOKE REGIONAL AIRPORT COMMISSION  
BUILDING 51 TENANT UPGRADES PROJECT**

**BID NUMBER 20-004**

**JANUARY 5, 2020**

THOMPSON & LITTON, INC.  
726 AUBURN AVE. RADFORD, VA 24134  
(540)633-1897



**Building 51 Tenant Upgrades Project  
Roanoke, Virginia  
For  
Roanoke Regional Airport Commission**

**T&L Project No. 12813**

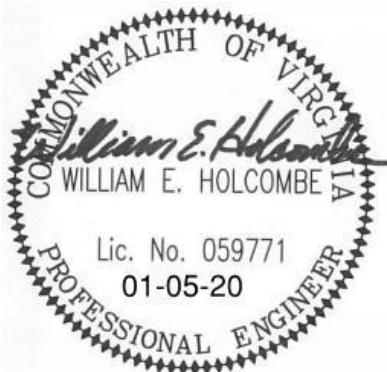
**SEALS PAGE**



For Architectural & Life  
Safety Only



For Plumbing Only



For Mechanical & Fire  
Protection Only



For Electrical Only



**BUILDING 51 TENANT UPGRADES PROJECT**

**RRAC BID NO: 20-004**

**TABLE OF CONTENTS**

<b>SECTION</b>	<b>TITLE</b>	<b>PAGE NUMBER</b>
<b>A.</b>	<b>Bid Information</b>	
	Invitation to Bid.....	5
	Instructions to Bidders.....	6
<b>B.</b>	<b>General Conditions, Including Special Conditions.....</b>	<b>16</b>
<b>C.</b>	<b>Bid Forms</b>	
	Bid Form.....	54
	Bid Bond.....	63
<b>D.</b>	<b>Contract Forms</b>	
	Contract Form.....	66
	Contractor's Performance Bond	
	Contractor's Labor and Material Payment Bond	
	Interim Lien Waiver and Release .....	83
	Final Lien and Claims Release .....	92
	Warranty of Construction .....	93
	Certificate of Final Acceptance .....	94
<b>E.</b>	<b>DRAWINGS INDEX .....</b>	<b>95</b>
<b>F.</b>	<b>Technical Specifications –.....</b>	<b>96</b>
<b>G.</b>	<b>Appendix A – Asbestos Survey</b>	

**DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS**

<b>00 5433</b>	<b>Request for Electronic Files Form</b>
<b>00 6275</b>	<b>Payment Application Checklist</b>
<b>00 6276</b>	<b>Application &amp; Certificate for Payment (AIA G702)</b>
<b>00 6276.10</b>	<b>Continuation Sheet (AIA G703)</b>
<b>00 6313</b>	<b>Request for Information (RFI) Form</b>
<b>00 6325</b>	<b>Request for Substitution Form</b>

**SPECIFICATIONS**

**DIVISION 01 - GENERAL REQUIREMENTS**

<b>01 1000</b>	<b>SUMMARY</b>
----------------	----------------

01 2200 UNIT PRICES  
01 3000 ADMINISTRATIVE REQUIREMENTS  
01 5000 TEMPORARY FACILITIES AND CONTROLS  
01 6000 PRODUCT REQUIREMENTS  
01 6116 VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS  
01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS  
01 7800 CLOSEOUT SUBMITTALS

**DIVISION 02 - EXISTING CONDITIONS**

02 4100 DEMOLITION

**DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

06 4100 ARCHITECTURAL WOOD CASEWORK

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

07 9200 JOINT SEALERS

**DIVISION 08 - OPENINGS**

08 1213 HOLLOW METAL FRAMES  
08 1416 FLUSH WOOD DOORS  
08 3100 ACCESS DOORS AND PANELS  
08 4313 ALUMINUM-FRAMED STOREFRONTS  
08 7110 DOOR HARDWARE SCHEDULE  
08 8000 GLAZING  
08 8723 SAFETY AND SECURITY FILMS

**DIVISION 09 - FINISHES**

09 2116 GYPSUM BOARD ASSEMBLIES  
09 3000 TILING  
09 5100 ACOUSTICAL CEILINGS  
09 6500 RESILIENT FLOORING  
09 6519 RESILIENT TILE FLOORING  
09 6813 TILE CARPETING  
09 9123 INTERIOR PAINTING

**DIVISION 10 - SPECIALTIES**

10 1400 SIGNAGE  
10 2113.19 PLASTIC TOILET COMPARTMENTS  
10 2800 TOILET, BATH, AND LAUNDRY ACCESSORIES

**DIVISION 12 - FURNISHINGS**

12 2400 WINDOW SHADE  
12 3600 COUNTERTOPS

**DIVISION 21 – FIRE SUPPRESSION**

21 1300 FIRE SUPPRESSION SPRINKLER SYSTEMS



**DIVISION 22 - PLUMBING**

- 22 0719 PLUMBING PIPING INSULATION
- 22 1005 PLUMBING PIPING
- 22 1006 PLUMBING PIPING SPECIALTIES
- 22 3000 PLUMBING EQUIPMENT
- 22 4000 PLUMBING FIXTURES

**DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)**

- 23 0130.51 HVAC AIR DISTRIBUTION SYSTEM CLEANING
- 23 0517 SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
- 23 0523 GENERAL – DUTY VALVES FOR HVAC PIPING
- 23 0529 HANGARS AND SUPPORTS HVAC PIPING AND EQUIPMENT
- 23 0548 VIBRATION AND SEISMIC CONTROLS FOR HVAC
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0593 TESTING, ADJUSTING, AND BALANCING FOR HVAC
- 23 0713 DUCT INSULATION
- 23 0719 HVAC PIPING INSULATION
- 23 0993 SEQUENCE OF OPERATION FOR HVAC CONTROLS
- 23 2113 HYDRONIC PIPING
- 23 2300 REFRIGERANT PIPING
- 23 2500 HVAC WATER TREATMENT
- 23 3100 HVAC DUCTS AND CASINGS
- 23 3300 AIR DUCT ACCESSORIES
- 23 3600 AIR TERMINAL UNITS
- 23 3700 AIR OUTLETS AND INLETS
- 23 4000 HVAC AIR CLEANING DEVICES
- 23 8126.13 SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

**DIVISION 25 – INTEGRATED AUTOMATION**

- 25 1400 INTEGRATED AUTOMATION LOCAL CONTROL UNITS

**DIVISION 26 – ELECTRICAL**

- 26 0505 SELECTIVE DEMOLITION FOR ELECTRICAL
- 26 0519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
- 26 0529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 26 0533.13 CONDUIT FOR ELECTRICAL SYSTEMS
- 26 0533.16 BOXES FOR ELECTRICAL SYSTEMS
- 26 0536 CABLE TRAYS FOR ELECTRICAL SYSTEMS
- 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS
- 26 0923 LIGHTING CONTROL DEVICES
- 26 2416 PANELBOARDS
- 26 2726 WIRING DEVICES
- 26 2816.16 ENCLOSED SWITCHES
- 26 5100 INTERIOR LIGHTING
- 26 5600 EXTERIOR LIGHTING

**DIVISION 27 - COMMUNICATIONS**

- 27 1000 STRUCTURED CABLING

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

28 4600 FIRE DETECTION AND ALARM

# BID INFORMATION

## SECTION A



**INVITATION FOR BIDS**  
**RRAC Bid No. 20-004**

The Roanoke Regional Airport Commission (“Commission”) will accept sealed bids for furnishing all labor, materials, and equipment and performing all work for the:

ROANOKE REGIONAL AIRPORT COMMISSION  
BUILDING 51 TENANT UPGRADES PROJECT

The work involves The Building 51 Tenant Upgrades and performing all associated services including asbestos abatement. Awarded contractor shall be responsible to obtain asbestos abatement permit and complete abatement prior to city issuance of the building permit. Bids shall be received until 2:00 p.m. local time on February 4, 2020 in the Office of Roanoke Regional Airport Commission, 5202 Aviation Drive, Roanoke, Virginia 24012. Bids will be publicly opened and read aloud at that time in Conference Room A on the Second Floor of the Airport Terminal Building.

The Contract Documents may be examined at the following locations: Builder’s Exchange, 3207 Hermitage Road, Richmond VA; Valley Construction News, 426 Campbell Ave SW, Roanoke, VA; DODGE Data ([www.construction.com](http://www.construction.com)); and TRASCO ([www.trascoplanroom.com](http://www.trascoplanroom.com)). Contract Documents will be distributed electronically and will be posted on eVA, Virginia Department of General Services’ central electronic procurement website, at <https://eva.virginia.gov>. Electronic copies of the Contract Documents can also be obtained by emailing Erin Henderson, Contracts Administration, Roanoke Regional Airport, at [Erin.Henderson@flyroa.com](mailto:Erin.Henderson@flyroa.com).

Bidders are invited to submit bids for this work on the bid forms provided in the package; other bid forms will not be accepted. The successful bidder shall be required to have and maintain a Class “A” Virginia Contractor’s License and not less than \$5,000,000.00 in general liability and motor vehicle insurance.

Each bid must be accompanied by a bid security in a form acceptable to the Commission in an amount equal to at least five percent (5%) of the amount of the bid by the Contractor, payable to the Roanoke Regional Airport Commission, as a guaranty that if the bid is accepted, the bidder will execute the Contract and file required Performance and Payment Bonds within the time provided in the Instructions to Bidders.

Minority business enterprises will be afforded full opportunity to submit bids in response to this Invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

A Pre-bid Meeting and site review will be held in the Commission's Conference Room “A” on January 14, 2020 at 1:00 p.m. local time. No other escorted reviews of the site will be provided.

The Roanoke Regional Airport Commission reserves the right to waive any informalities, technicalities, or irregularities in a Bid, or to reject any or all bids, or to re-advertise for bids and to award or refrain from awarding the Contract for the project specified, should any such action be deemed to be in the best interest of the Commission.



## ROANOKE REGIONAL AIRPORT COMMISSION

### INSTRUCTIONS TO BIDDERS

#### I. GENERAL

- A. The Contractor covenants and agrees that it and its agents and employees shall comply with and shall be solely responsible for compliance with all applicable municipal, state and federal laws, national and local codes, and Roanoke Regional Airport Commission rules and regulations applicable to the removal, preparation, and installation of materials and other associated products and services to be provided pursuant to the Contract Documents.
- B. As used herein, the terms "Owner," "Commission," "Airport Commission," or "Sponsor," or shall refer to the Roanoke Regional Airport Commission.
- C. As used herein, the terms "Work," or "Project" shall refer to all construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations.
- D. As used herein, the terms "Contractor" and "successful bidder" shall refer to the person or entity selected to enter a contract with the Commission for the above referenced Work.
- E. As used herein, the term "Contract" or "Contract Documents" shall mean and include the Invitation to Bid, Instruction to Bidders, Bid Forms, the Performance Bond, Labor and Material Payment Bond, Contract Form, General Conditions, Drawings, Technical Specifications, Supplementary Drawings, any addenda issued to bidders, and any other documents specifically incorporated by reference in the Contract Form.
- F. Attention of all prospective bidders is directed to the fact that the Airport Commission is a governmental body, and in accordance with Virginia law is not subject to state sales tax (Tax Exemption #54-1480233-9); however, such exclusion does not extend to Contractor in its purchase of goods and services for the Project.
- G. The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the Work.
- H. **LIQUIDATED DAMAGES.** Time is of the essence in the completion of the Work. Bidders are advised that the Contract Documents do contain provisions for liquidated damages, including without limitation, liquidated damages for failure to complete the Work in a timely manner. **By submitting a bid, a**

**bidder acknowledges and agrees that the bidder has been advised of such liquidated damages and has reviewed and agreed to all liquidated damages provision in the Contract Documents, including, without limitation, Contractor's waiver of any defenses as to the validity of such liquated damages based on such liquidated damages being void as penalties or not being reasonably related to actual damages.**

I. All proposals or bids and any accompanying or related information submitted to the Commission will become the property of the Commission and will not be returned. Trade secrets or proprietary information submitted by a proposer or bidder may not be subject to the Virginia Freedom of Information Act (Section 2.2-3700 et seq.), provided that the proposer or bidder: (i) properly invokes the protections of the applicable sections of the Virginia Code, as amended, including, without limitation, Virginia Public Procurement Code Section 2.2-4342 for trade secrets or proprietary information prior to or upon submission of the data or other materials to be protected; (ii) clearly identifies the data or other materials in the proposal to be protected; and, (iii) states in writing the reasons why protection is necessary.

By submitting a proposal or bid, the submitting entity consents and agrees that, notwithstanding any express or implied claim of copyright, any and all documents submitted to the Commission are not subject to copyright and, as such, may be copied; however, the release of such documents shall be governed by applicable law, including, without limitation, the Virginia Freedom of Information Act.

## II. **GENERAL BOND REQUIREMENTS**

### A. Bid Bond

Each separate Bid shall be accompanied by a Certified or Cashier's Check or a Bid Bond on the form provided herein in the amount of not less than five percent (5%) of the total amount bid, including all alternates, made payable to the Roanoke Regional Airport Commission. If a Bid Bond is provided in lieu of a Certified or Cashier's Check, it must be signed by the bidder as principal and by a corporate surety authorized to transact business in Virginia, be substantially on the form included with the Bid Forms herein, include an executed surety bond affidavit and be accompanied by a valid power of attorney indicating that the person signing the bond on behalf of the Surety has full legal authority to do so.

### B. Performance and Labor and Material Payment Bonds

Good and sufficient Performance and Labor and Material Payment Bonds in substantially the forms contained in these specifications and in the sum of not less than 100 percent of the contract amount, with a surety Company



satisfactory to the Owner and licensed to conduct business in the Commonwealth of Virginia, will be required of the Contractor guaranteeing that the contract, including the various guarantee periods hereunder, will be faithfully performed and that labor and material suppliers shall be paid. The fully executed Bonds, along with appropriate Power of Attorney and the executed Contract, shall be delivered to Owner, no later than fifteen (15) calendar days from the date of receipt of Owner's Notice of Award. If, at any time after the execution of the agreement, Owner shall deem the surety or sureties upon such bond or bonds to be unsatisfactory, or if, for any reasons, such bond or bonds ceases to be adequate to cover the performance of the work as above specified, Contractor shall, at its expense within five (5) days of receipt of Owner's written notice to do so, furnish additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the Owner. In such event, no payment to the Contractor shall be deemed due under the agreement until such new or additional bond or bonds are furnished in a manner and form satisfactory to the Owner.

Only the Performance and Labor and Material Payment Bond Forms in substantially the form as are bound as CPB-1 thru CPB-4 and LMPB-1 thru LMPB-5 within these documents are acceptable.

### III. **PREPARATION AND SUBMISSION OF BIDS**

- A. The Bidder must submit its Bid on the Bid Forms contained herein; no other form is acceptable. Any bid received after the time specified in the Invitation to Bid for receipt shall be returned to the bidder unopened.
- B. All blank spaces in the Bid Forms must be correctly and completely filled in, where indicated, in ink or type written, except that all signatures shall be signed in ink by an official of the firm who is authorized to submit the bid.
- C. The Bidder must state the price(s) (typewritten or in ink) both in words and numerals. Where a discrepancy occurs between the prices quoted in words and/or in numbers, the figure quoted in words shall take precedence and govern in the determining final costs or award of the contract.
- D. Erasures or other changes in a Bid shall be made on the bid form and be explained or noted and dated over the signature of the Bidder prior to the bid submittal time and the sealing of the bid envelope. No alterations to the bid figures by notations on the outside of the envelope will be considered.
- E. Bids containing reservations, exceptions, conditions, omissions, unexplained erasures or alterations, items not required in the bid or irregularities of any kind may be rejected by the Owner.

- F. When requested by the Owner, a Power of Attorney or other satisfactory evidence of the authority of the official signing in behalf of the firm shall be furnished for the Owner's records.
- G. The cost of any item whatsoever, not listed in the Bid Form, yet which is mentioned in the Specifications or shown on the Plans, shall be considered to be included in the cost of some other item of bid in the Bid Form or as part of the total bid price.
- H. Information Required
1. The bidder must supply all information required by the bid **and fully complete each page of the Bid Form in Section C, and shall provide with its Bid the additional information and documents listed in this Section H. and Section I. below.**
  2. Each bidder shall present evidence of its experience, qualifications and financial ability, upon the form enclosed herein, to perform the work and to satisfactorily complete the project. Qualifications information shall include the identification of the proposed on-site superintendent with relevant project experience on similar work at the same level of responsibility (complete Part III of the Section C Bid Form).
  3. No bid will be received and tabulated or considered, nor any contract awarded, unless the bidder has demonstrated in the bid form that it is properly licensed as a Class A Contractor, as required under the Code of Virginia (1950), as amended (complete Part II of the Section C Bid Form).
  4. Each Bidder shall complete and submit with its bid the Worker's Compensation Certificate of Coverage appearing as Part V of the of the Section C Bid Form of these contract documents. No award shall be made to any Bidder who fails to show such evidence of required Worker's Compensation coverage.
  5. Every bidder shall include in its bid the identification number issued to it by the State Corporation Commission confirming that it is organized or authorized to transact business in the Commonwealth pursuant to Title 13.1 or Title 50. If the bidder is not required to be authorized to transact business in the Commonwealth as a foreign business entity under Title 13.1 or Title 50 or as otherwise required by law, the bidder or shall include in its bid a statement describing why the bidder is not required to be so authorized. Any bidder that fails to provide the required information shall not receive an award unless a waiver of this requirement is granted by the Commission's Executive Director. (Complete Part VI of the Section C Bid Form.)

7. Each bidder shall provide the bid bond or security specified in Section A.II.A. above. (Complete Bid Bond Form found in Section C Bid Form of these bid documents)

I. Bid Package

1. Each Bidder shall present its Bid in a sealed, opaque 9 x 12 inch envelope. The outside of the envelope shall be plainly marked on the bottom left hand corner with:

Bid For: BUILDING 51 TENANT UPGRADES PROJECT  
Bid No. 20-004  
Roanoke Regional Airport  
Roanoke, Virginia  
Class "A" Virginia Contractor No. \_\_\_\_\_

with the name and address of the Bidder in the upper left hand corner. The Owner shall not be responsible for premature opening of bids not properly addressed and identified, as required herein.

2. The envelope shall contain the signed original of:

Bid Form Fully completed with all blanks filled in and all requested information provided (see Section A.H. 1-5) and including the signature of an authorized official of Bidder and the Bidder's Class "A" Virginia Contractor's License Number;

Bid Bond Bid Bond or Guarantee (see Section A.II.A.), fully completed and signed by Bidder and, if applicable, its Surety.

- J. All bids shall be delivered to the Roanoke Regional Airport Commission, Administrative Offices, 5202 Aviation Drive, Roanoke, VA 24012, no later than 2:00 PM, local time, on February 4, 2020.
- K. When sent by mail, the sealed Bid, marked as indicated in I.1. above, shall be sent by certified mail with return receipt requested or by overnight express carrier. No bid will be considered unless received by the Commission on or before the time and at the place designated in the Invitation to Bid. The Commission will in no way be responsible for delays caused by the U. S. Postal Service or any other deliverer of the bid, or for delay caused by any other occurrence. Any bid received after the time specified in the Invitation to Bid for receipt of bids, shall be returned to the Bidder unopened.
- L. A pre-bid meeting and site review will be provided by Commission's representatives on January 14, 2020 at 1:00 PM in order to assist Bidders in preparing their bid packages. Any interested bidder should arrive at the Commission's office, Second Floor Terminal Building, by the specified time in

order to discuss the project and be escorted to view the site. No additional meetings or site reviews will be provided or allowed.

#### IV. **INTERPRETATIONS**

- A. Each Bidder shall carefully examine the Contract Documents and all addenda or other revisions and thoroughly familiarize itself with the detailed requirements prior to submitting a Bid. Should a Bidder find discrepancies or ambiguities in, or omission from the Contract Documents, or should it be in doubt as to their meaning, it shall at once, and in any event, not later than 2:00 PM on January 23, 2020, notify Erin Henderson, the Owner's Contracts Administrator in writing, or by fax to (540) 563-4838, of the nature of the problem or question. Said Contracts Administrator will send or arrange for the sending of written Addenda and/or answers to questions to all Bidders of record who have requested a bid package. Bidders shall not seek nor be entitled to rely upon any oral instructions, statements, or interpretations by Owner or Owner's Consultant. All Addenda sent to Bidders will become a part of the Contract Documents.
- B. Acknowledgment or receipt of all Addenda shall be made by each bidder in the space provided in the Bid Form.

#### V. **MODIFICATIONS AND/OR WITHDRAWAL OF PROPOSALS**

A. Prior to Bid Opening:

A Bidder may withdraw or revise (by withdrawal of one bid and submission of another) a bid, provided that Bidder's request for withdrawal is received by the Owner in writing or by telegram or fax before the time specified for opening bids. Revised bids must be received at the place specified in the Invitation to Bid before the time specified for opening all bids.

B. Withdrawal After Bid Opening:

1. A Bidder may withdraw its bid from consideration if the price bid is substantially lower than the other bids due solely to a mistake therein, provided the bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of work, labor or material made directly in the compilation of a bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the bid sought to be withdrawn. The Bidder shall give notice in writing of its claim of right to withdraw its bid within two (2) business days after the conclusion of the bid opening procedure, and shall submit original work papers, documents and materials used in preparation of such bid with the written

notice. The work papers, documents and materials submitted by the bidder shall, at the bidder's request, be considered trade secrets or proprietary information. The mistake shall be proved only from the original work papers, documents and materials delivered as required herein.

2. No bid may be withdrawn under this section when the result would be the awarding of the contract on another bid of the same Bidder or of another bidder in which the ownership of the withdrawing bidder is more than five (5) percent.
3. If a bid is withdrawn under the authority of this section, the lowest remaining responsive and responsible bid shall be deemed to be the low bid.
4. No Bidder who is permitted to withdraw a bid shall, for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the contract is awarded or otherwise benefit, directly or indirectly, from the performance of the project for which the withdrawn bid was submitted.
5. The Executive Director shall notify the bidder in writing within five business days of the decision regarding the bidder's request to withdraw its bid. If the Commission's Executive Director denies the withdrawal of a bid under the provisions of this Section, the Executive Director shall notify the Bidder and Commission in writing shall state in such notice the reasons for the decision and shall recommend award of the Contract by Commission to such Bidder at the bid price, provided such Bidder is a responsible and responsive bidder. At the same time that the notice is provided, the Commission shall return all work papers and copies thereof that have been submitted by the bidder.

## VI. **REJECTION OF BIDS**

- A. Bids containing any omission, alterations of form, additions, exceptions or conditions not called for, conditional or alternate bids unless called for, or incomplete bids may be considered nonresponsive, irregular, or informal and may be rejected.
- B. If the bid from the lowest responsible and responsive bidder exceeds funds budgeted and tentatively allocated for this specific project, the Executive Director may negotiate with the apparent low bidder to obtain a contract price within available funds. The Executive Director shall determine that the lowest responsible and responsive bid exceeds funds available for this project and notify such bidder in writing of the Commission's desire to negotiate. Thereafter, negotiations with the apparent low bidder may be held to obtain a contract within available funds involving discussions of reduction of quantities, or other cost saving mechanisms. Any such negotiated contract shall be subject to the Commission's final approval.

- C. The Commission reserves the right to award the Contract to a Bidder other than the apparent low Bidder if such bidder is not the lowest responsible and responsive bidder. Should a contract be awarded to a Bidder other than the apparent low Bidder, it will be awarded to the lowest responsive and responsible Bidder meeting all requirements of these Contract Documents.
- D. The Commission reserves the right to accept or reject alternates in any order or combination, to waive any informalities or irregularities in any bid, to accept any part of or combination of bids, to reject any or all bids, and to re-advertise and rebid, should any said action be deemed to be in the best interest of the Commission.

VII. **AWARD AND EXECUTION OF CONTRACT**

A. Consideration of Bids and Award of Contract

The Commission reserves the absolute right to consider all bids and to determine, after such consideration, whether to award a contract for the Project. If a contract is awarded, the award will be to the lowest responsive and responsible bidder selected by the Commission; as such award may be evaluated to be in the best interest of the Commission. No award will be made until the Commission has concluded such investigations as it deems necessary to establish the responsibility, qualifications and financial ability of the bidders and their products to perform in accordance with the contract documents to the satisfaction of the Commission within the time prescribed. The Commission reserves the right to reject the bid of any bidder who does not pass such investigation to the Commission's satisfaction. If the Contract is awarded, the Commission will give the successful bidder written notice of the award within sixty (60) calendar days after the opening of the bids. Until the final execution and delivery of the Contract back to the successful bidder, the Commission reserves the right to reject any or all bids, to waive informalities, technicalities or non-material defects or to advertise for new bids, or to proceed to do the work otherwise should any such action be deemed to be in the best interests of the Commission.

B. Acceptance of Bid

As soon as the bids have been reviewed and compared, which shall occur within thirty (30) consecutive calendar days after the Bid Opening date, the Roanoke Regional Airport Commission may give written "Notice of Bid Acceptance." The successful bidder shall be required, within fifteen (15) consecutive calendar days after the receipt of the "Notice of Bid Acceptance" to execute the Contract and return the Contract to the Commission.

C. Execution of Contract

The successful Bidder shall sign (execute) the Contract and return such signed Contract to the Owner, along with required insurance certificates and completed bond forms within fifteen (15) calendar days from the date of receipt of the Notice of Award by Owner. If the successful Bidder shall fail to execute the Contract within such fifteen (15) day period, the Commission may require forfeiture of the Bid Security, pursue any other remedies available at law or in equity, rescind the contract award and/or the Commission may then proceed to accept the Bid of the next lowest responsive and responsible Bidder. If the Contract is mailed, special handling is recommended.

D. Approval of Contract

Upon receipt from the successful bidder of required insurance documents, the executed Contract, the Performance and Payment Bonds, the construction schedule and any other required documents, the Owner may complete the execution of the Contract in accordance with applicable laws, and return a copy of the fully executed Contract to the Contractor. No contract is binding upon the Owner until it has been executed by the Owner and delivered to the Contractor. Work shall commence only upon Contractor's receipt of a written notice to proceed from Owner.

E. Failure to Execute Contract

Failure of the successful bidder to execute the Contract and furnish the required insurance documents and bonds within the 15 calendar days period after receiving Notice of Award shall be just cause for cancellation of the award. An award may then be made to the next lowest responsive and responsible bidder, or the work re-advertised, or handled as the Owner may determine in its sole and exclusive discretion.

F. Failure to Accept Bids

Should no "Notice of Bid Acceptance" be issued by Owner within sixty (60) consecutive calendar days after the opening of bids, each Bidder may have its bid security returned from Owner.

G. Additional Requirements

Title VI Solicitation Notice

The Commission, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all proposers that it will affirmatively ensure that for any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

### Federal Fair Labor Standards Act (Federal Minimum Wage)

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR Part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

### Occupational Safety and Health Act of 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (29 CFR Part 1910). Contractor must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.



**GENERAL CONDITIONS**

**SECTION B**



## **B. GENERAL CONDITIONS**

### **1. Contract Documents**

Contract Documents ("Contract") shall include: the Invitation to Bid, Instructions to Bidders, Completed Bid Forms, Addenda issued to Bidders, Completed Contract Form, General Conditions, Performance Bond, Labor and Material Payment Bond, Technical Specifications, Drawings, Supplementary Drawings, Appendices, and any Supplemental Agreements between the parties.

### **2. Time of Completion (Contract Time), Notice to Proceed and Liquidated Damages**

A. **Contract Time.** The work under this Contract shall be completed and final acceptance issued by the Owner in accordance with Subparagraph B below.

B. **Notice to Proceed.** The Contractor will be issued one Notice to Proceed for the work under this Contract. The contractor will attend a preconstruction conference, prepare, submit and have approved work and phasing schedules, safety plans, other required submittals, etc.; and order supplies and other equipment needed for the project. All work preliminary to the actual start of labor at the Airport must commence within ten (10) calendar days of the effective date of the Notice to Proceed. Review time by the Owner and/or Engineer during which Contractor can undertake none of the administrative tasks shall not be counted as part of this time period.

All work, including administrative work and site work, on site shall commence within ten (10) calendar days and shall be completed within one hundred twenty (120) calendar days of the effective date of the Notice to Proceed, including all inspections and testing procedures required by these contract documents.

Contractor may not enter the work site or begin work at the airport prior to the obtaining of all required permits and the approval of all required submittals, nor shall the 120 calendar days be tolled while the contractor is unable to work. In such case, Owner would also have a basis for canceling the Contract for cause in accordance with the Contract Documents.

The Contractor shall notify the Owner and the Consultant at least 48 hours in advance of the time any operations will begin at the Airport.

**C. Liquidated Damages. Time is of the essence in the completion of this Contract. The Contract Documents contain provisions for liquidated damages, including without limitation, liquidated damages for failure to complete each phase of the Work in a timely manner and a waiver by Contractor of any defenses as to the validity of such liquidated damages.**

Contractor acknowledges and agrees that the Contractor has been advised of such liquidated damages and has reviewed and agreed to all liquidated damages provisions in the Contract Documents, including, without limitation, Contractor's waiver of any defenses as to the validity of such liquidated damages based on such liquidated damages being void as penalties or not being reasonably related to actual damages.

3. **Owner's Representative**

In addition to Owners employees, in particular its Project Coordinator, Alex Plaza, Owner has contracted for the services of a Consultant to draft and interpret technical specifications and to provide oversight for the Project.

Whenever in these Contract Documents reference is made to "Consultant", "Architect" or "Engineer," it is intended to mean Thompson and Litton, Inc., and any other consultant contracted by the Owner to assist on this project.

4. **Authority of the Consultant**

The Consultant shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the Work. It shall decide all questions which may arise as to the interpretation of the specifications or plans relating to the Work and the fulfillment of the contract on the part of the Contractor. The Consultant shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for the under contract.

5. **Conformity with Drawings and Specifications**

If the Consultant finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the Contract Documents, but that the portion of the Work affected will, in its opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, it will advise the Owner of its determination that the affected work be accepted and remain in place. In this event, the Consultant will document its determination and recommend to the Owner a basis of acceptance which will provide for an adjustment in the contract price for the affected portion of the work. The Consultant's determination and recommended Contract price adjustments will be based on good consulting judgment and such tests or retests of the affected work as are, in its opinion, needed. Changes in the contract price shall be covered by contract modifications (change order or supplemental agreement) as applicable.

If the Consultant finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the drawings and specifications and have resulted in an unacceptable finished product, the affected work or

materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the Owner's and/or Consultant's written orders.

For the purpose of this subsection, the term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the Work in accordance with the contract, drawings, and specifications. The term shall not be construed as waiving the Consultant's right to insist on strict compliance with the requirements of the Contract Documents, during the Contractor's prosecution of the Work, when, in the Consultant's opinion, such compliance is essential to provide an acceptable finished portion of the Work or for the Project.

For the purpose of this subsection, the term "reasonably close conformity" is also intended to provide the Consultant with the authority to use good professional judgment in its determinations as to acceptance of work that is not in strict conformity but will provide a finished product equal to or better than that intended by the requirements of the Contract Documents.

#### **6. Coordination of Contract, Drawings, and Specifications**

The Contractor shall not take advantage of any apparent error or omission on the Contract Documents. In the event the Contractor discovers any apparent error or discrepancy, it shall immediately call upon the Consultant for its interpretation and decision, and such decision shall be final.

#### **7. All Costs Included**

The Contractor shall provide and pay for all permits, materials, equipment, labor, demolition, transportation, inspections, disposal costs, delivery charges, fuel, telephone, room and board expenses, and all other facilities and incidentals necessary for the execution and completion of the work as described in the Contract Documents. No amount in addition to the bid price will be paid Contractor for any of the work or services specified in the Contract Documents.

All materials and equipment added and incorporated in the work shall be new, unless otherwise specified. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

#### **8. Laws to Be Observed**

Contractor expressly warrants that in the performance of the Work it shall comply with all applicable laws, codes, regulations, standards, etc., which may be required of it by all applicable local, state and federal jurisdictions and their respective agencies, offices, bureaus, and other administrative/regulatory entities, including, but not limited to, all local, state and federal ordinances, laws and regulations, concerning building and fire codes, solid waste and environmental matters, FAA, TSA and airport security regulations, and all applicable sections of the

Occupational Safety and Health Act (OSHA), the Virginia Uniform Statewide Building Code.

The Contractor shall be responsible for arranging all inspections by local authorities for compliance with all building code requirements, ordinances and regulations.

**9. Permits, Licenses, and Taxes**

The Contractor shall be solely responsible for providing and shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work.

The Contractor shall obtain or possess a valid Contractor's Business License in accordance with any applicable City of Roanoke Ordinances.

A City of Roanoke Building permit is for this project.

**10. Airport Security**

**A. Work Area and Badges**

This project shall be located outside the Airport Air Operations Area (AOA), Secured Area, SIDA and Sterile Area; therefore no identification badges shall be required. However, Contractor acknowledges that the areas within the airport fenceline are parts of a highly restricted access area. Contractor agrees to be responsible for, and to insure that, none of its employees, agents, subcontractors or representatives' gains access, enters or moves about the area inside the fenceline. Contractor, its employees, agents, subcontractors and representatives shall comply with the requirements of Owner's federally mandated security program at Contractor's sole cost and shall be subject to the penalties of such program.

**B. Remaining within Work Site**

Contractor shall delineate limits of construction and access with its employees daily. None of Contractor's employees or those of its subcontractors should move beyond or outside such limits without authorization of the Owner. Violators are subject to removal from the jobsite.

**11. Notice to Proceed**

This section has been moved to Section 2 above.

**12. Prosecution and Progress**

The Contractor shall bring to the Preconstruction Conference its progress schedule for the Consultant's approval. The Contractor's progress schedule, when approved by the Consultant, may be used to establish major construction operations and to check on the progress of the Work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the drawings and specifications within the time set forth in the Contract Documents.

If the Contractor falls behind the submitted schedule, the Contractor shall, upon the Consultant's request, submit a revised schedule for completion of the Work within the contract time and modify its operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the prosecution of the Work be discontinued for any reason, the Contractor shall notify the Consultant at least 48 hours in advance of resuming operations.

The Contractor shall not commence any work prior to the effective date on which the notice to proceed is issued by the Owner. Once begun, the Contractor shall perform the work continuously until completion.

### **13. Character of Workers, Methods, and Equipment**

The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the Contract Documents.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily. Neither Contractor nor its employees, agents, invitees or subcontractors shall bring any firearms or other weapons onto airport property; nor shall any person come onto or remain upon airport property while under the influence of alcohol or illegal drugs.

Any person employed by the Contractor or by any subcontractor who, including the project superintendent, in the opinion of the Consultant, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Consultant or Owner, be removed forthwith by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the Work without the consent of the Consultant or Owner.

Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the Work, the Consultant may suspend the Work by written notice until compliance with such orders.

All equipment which is proposed to be used on the Work shall be of sufficient size and in such mechanical condition as is necessary to meet requirements of the

Work and to produce a satisfactory quality of Work. Equipment used on any portion of the Work shall be such that no injury to previously completed Work, adjacent property, existing airport facilities or persons will result from its use.

**No gunpowder-activated equipment shall be utilized on this project.**

When the methods and equipment to be used by the Contractor in accomplishing the Work are not prescribed in the Contract, the Contractor is free to use any methods or equipment that will accomplish the Work in conformity with the requirements of the Contract Documents.

When the Contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Consultant. If the Contractor desires to use a method or type of equipment other than specified in the Contract, it may request authority from the Consultant to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with Contract requirements. If, after trial use of the substituted methods or equipment, the Consultant determines that the work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the Consultant may direct. No change will be made in basis of payment for the Contract items involved nor in Contract time as a result of authorizing a change in methods or equipment under this subsection.

**14. Cooperation of Contractor**

The Contractor will be supplied with four copies each of the Drawings and Technical Specifications. It shall have available at the work site at all times one copy each of the drawings and specifications, along with a record of all field deviations and revisions. Additional copies of drawings and specifications may be obtained by the Contractor for the cost of reproduction.

The Consultant shall notify the Contractor as to the location, date, and time of a Preconstruction Conference to confirm and discuss matters pertaining to scheduling and execution of the Work. The Contractor shall bring to the Preconstruction Conference a detailed progress and phasing schedule for the project. Once the Contractor's plan is approved, any deviations must receive the Consultant's approval.

The Contractor shall give constant attention to the Work to facilitate the progress thereof, and it shall cooperate with the Owner and Consultant and any inspectors and with other contractors in every way possible. The Contractor shall have a competent superintendent or foreman on the Work at all times who is fully



authorized as its agent on the work, and who will be available to contact on a 24-hour basis throughout the duration of the Contract. The superintendent or foreman shall be capable of reading and thoroughly understanding the drawings and specifications and shall receive and fulfill instructions from the Consultant or its authorized representative.

**As part of its bid, the Contractor shall provide the resume of and work references for the proposed job superintendent, who shall have similar and relevant project experience with the same level of responsibility prior to award of the contract. The Owner specifically retains the right to reject such project superintendent if the level and type of prior experience, or the references from prior projects, are not considered by the Owner to be good and adequate. If the Owner rejects the proposed Superintendent, or should a replacement superintendent be required prior to completion of the project, Contractor shall provide information regarding a replacement and Owner shall have the right of approval of replacement superintendent.**

The Contractor shall meet with a representative of Owner at the beginning of each work day to discuss and coordinate the anticipated work tasks, deliveries, and tenant operational issues.

Should the Contractor encounter conditions differing from those shown on the Drawings or mentioned in the Specifications, or encounter work not covered by the contract to be in need of repair, it shall immediately give notice to the Consultant. The Consultant will promptly investigate the conditions and direct the Contractor as to the changes or repairs that will be required to correct the conditions.

## 15. Alteration of Work and Quantities

- A. Change Orders. The Owner reserves and shall have the right to make such alterations in the Work as may be necessary or desirable to complete the Work originally intended in an acceptable manner. All changes in the Work shall be effectuated by prior written change orders issued by the Consultant and approved and signed by the Consultant, Owner, and the Contractor or subsequent to a Construction Change Directive as described herein. Change orders for altered work shall include extensions of Contract time where, in the Consultant's opinion, such extensions are commensurate with the amount and difficulty of added work and/or they affect the critical path for the Project.

If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a change, the Owner reserves the right to terminate the Contract with respect to the item and make other arrangements for its completion.

The Contractor's performance and payment bond surety shall waive notice of, and in the bond shall consent to, any subsequent additions, deletions, alterations, extensions, or forbearances relative to the Project and the Contractor's obligations under the Contract Documents, including without limitation the amount of Work to be done, the amount of payment for such Work, or the time allocated to complete such Work. The Surety shall agree to be bound to the full extent of the bond amount for any such additions, deletions, alterations, extensions, or forbearances concerning the Project and the Contractor's obligations under the Contract Documents.

Except as specified in Section B. Construction Change Directives below, no change, alteration, addition or deletion with respect to the Work shall be made by the Contractor unless authorized by prior written change order issued by the Consultant and endorsed in writing by the Owner. The Contractor shall submit requests for changes in the Contract price and/or completion time in writing to the Consultant within ten (10) calendar days of any occurrence claimed as the basis for the need for a change. The Contractor shall be required to certify the cause of the change order and, if appropriate, length of time involved. Contractor's failure to give such 10-day written notice of such occurrence giving rise to the need for a change order shall be deemed a waiver by the Contractor of any claim for additional compensation and/or contract time relative to the occurrence. Should the Consultant deny Contractor's request for the desired change order for additional compensation or completion time, any claim by Contractor with Owner shall be filed in accordance with the requirements of Subsection 39 below.

- B. Construction Change Directives. A construction change directive is a written order prepared by the Consultant and signed by the Owner and Consultant,

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

1. A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.
2. If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:
  - a. Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
  - b. Unit prices stated in the Contract Documents or subsequently agreed upon;
  - c. Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
  - d. As provided in Section 6. below.
3. If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.
4. Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Consultant of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.
5. A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.
6. If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Consultant shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change,

including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 2.c. above, the Contractor shall keep and present, in such form as the Consultant may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section G. shall be limited to the following:

- a. Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
  - b. Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
  - c. Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
  - d. Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
  - e. Additional costs of supervision and field office personnel directly attributable to the change.
7. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that result in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Consultant. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.
8. Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Consultant will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Consultant determines, in the Consultant's professional judgment, to be reasonably justified. The Consultant's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of Contractor to disagree and assert a Claim in accordance with Section 39 herein.
9. When the Owner and Contractor agree with a determination made by the Consultant concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Consultant will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

**C.** In determining the cost to the Owner resulting from either an increase or a decrease in the Work, by either Change Order or Construction Change Directive, when no unit price has been bid or agreed upon, the allowances for overhead and profit combined, included in the total cost to the Owner, shall not exceed the percentages as follows:

1. For the Prime Contractor, for any Work performed by its own forces, 15% of the cost;
2. For the Prime Contractor, for Work performed by his Subcontractors, 7% of the amount due the Subcontractor;
3. For each Subcontractor involved, for Work performed by its own forces, 15% of the cost;
4. For each Subcontractor, for Work performed by its lower tier Subcontractors, 7% of the amount due the lower tier Subcontractor.

**16. Public Convenience and Safety**

The Contractor shall control its operations and those of its subcontractors and all suppliers, to assure the least inconvenience to the airport tenants and the traveling public. Under all circumstances, safety shall be the most important consideration.

**17. Barricades, Warning and Notification Signs, and Hazard Markings**

The Contractor shall furnish, erect, and maintain all barricades, warning and notification signs, and markings for hazards necessary to protect airport employees, airport tenants, the public and the Work. During any work on or around the Terminal or elsewhere as appropriate, the Contractor shall install the proper barricades and signage in the designated work area. Placement of signs shall comply with the intent of the RRAC provided Maintenance of Traffic plans, the Contractor shall be responsible to obtain VDOT approval of the Traffic Management Plan. Contractor shall coordinate placement of signs and other requirements for signs with the Owner. Signs shall be metal with wording, lettering size and type of stands determined by the Owner. Cost of signs and stands to be included in the price bid for other items.

**18. Opening Sections of the Work**

Should it be necessary for the Contractor to complete portions of the Contract Work for the beneficial occupancy of the Owner prior to completion of the entire Contract, such "phasing" of the Work shall be specified herein and indicated on the Drawings. When so specified, the Contractor shall complete such portions of the Work on or before the contract time of completion specified or as otherwise specified. The Contractor shall make its own estimate of the difficulties involved in arranging its work to permit such beneficial occupancy by the Owner.

The Contract phasing will be as described in “as presented by Contractor and specifically approved by Owner”. Upon completion of any portion of the Work to satisfy the phasing requirements, such portion may be accepted by the Owner in accordance with the subsection titled PARTIAL ACCEPTANCE, Subsection 31 of Section B.

No portion of the Work may be opened by the Contractor for public use until authorized by the Consultant in writing. Should it become necessary to open a portion of the Work to public traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Consultant, such portion of the Work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the Contract. Any damage to the portion of the Work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at its expense.

The Contractor shall make its own estimate of the inherent difficulties involved in completing the Work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the Contract Work.

**19. Maintenance During Construction**

The Contractor shall maintain the Work during construction and until the Work is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

All costs of maintenance work during construction and before the project is accepted shall be included in the price bid for the Work, and the Contractor will not be paid an additional amount for such work.

**20. Contractor's Responsibility for Work**

Until the Consultant's final written acceptance of the entire completed Work, excepting only those portions of the work accepted in accordance with the subsection titled PARTIAL ACCEPTANCE, Subsection 31 of these General Conditions, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to any cause, whether arising from the execution or from the no execution of the Work. The Contractor shall repair, restore, and make good all injuries or damages to any portion of the Work occasioned by any of the above causes before final acceptance and shall bear the expense thereof.

If the Work is suspended for any cause whatever, the Contractor shall be responsible for the Work and shall take such precautions necessary to prevent damage to the Work.

**21. Failure to Maintain the Work**

Should the Contractor at any time fail to maintain the Work as provided in the subsection titled MAINTENANCE DURING CONSTRUCTION, Subsection 19 of these General Conditions, the Consultant shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the Consultant's notification, the Consultant may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be deducted from monies due or to become due the Contractor.

**22. Risk of Loss**

Risk of loss or damage from any source shall not pass to the Owner until final acceptance.

The Contractor shall immediately replace missing or damaged equipment or materials and will be responsible for making any and all claims against carriers.

**23. Maintenance of Traffic**

It is the explicit intention of the Contract that the safety of the public, airport employees, airport tenants, and the Contractor's equipment and personnel is the most important consideration. It is understood and agreed that the Contractor shall provide for the free, unobstructed and safe movement of members of the public in the public areas of the airport with respect to its own operations and the operations of all its subcontractors.

With respect to its own operations and the operations of all its subcontractors, the Contractor shall provide markings, lighting, signing, flagging, barricades and other acceptable means of identifying: personnel, equipment, storage areas, and any work area or condition that may be hazardous to the passage of the public and airport employees and tenants and/or required by the Owner.

24. **Maintenance of Work Site and Daily/Nightly Return of Work Area to Operational Condition**

At the completion of each work day or night work session, any and all areas of construction activities at the Building shall be left in a condition whereby operations can be conducted without subjecting the public, Airport employees and tenants to hazardous or unsafe conditions.

- All public areas shall be open and safely accessible to the public, unless otherwise noted herein.
- All material storage, removal and installation operations shall not obstruct safe entrances and/or exits to the Building, except as required by the Work and approved by the Owner. All materials, equipment and vehicles shall be removed from the work area at the end of each day's work, with the possible exception of the work area barricades, marking, signing and lighting systems.
- **All debris shall be removed and all work area demolition removal routes cleaned; waste and loose material capable of causing damage to aircraft landing gears, propellers or being ingested in jet engine, shall not be placed, permitted to drop or be blown by the wind or jet blast onto the aircraft ramp at any time. Material tracked on or near this area shall be removed continuously during the Work. All debris must be containerized; no open-topped debris containers or dumpsters will be allowed. Use magnetic broom equipment continuously to control metallic materials on the aircraft parking ramp and the entrances onto the ramp.**
- All material and stock shall be secured and barricaded at locations determined by the Owner and shall not unduly obstruct Airport operations.

25. **HAZARDOUS AND OTHER WASTES, MATERIAL AND SUBSTANCES**

- A. Contractor shall not dispose of or release any wastes of any kind, whether hazardous or not, on Owner's premises.
- B. Contractor shall remove from the airport all waste and debris arising from its work at the airport and shall dispose of it properly, in accordance with all applicable laws. In particular, Contractor shall remove all new, used and empty paint containers; all new and used lubricants, sealants, solvents and cleaners; and rags, cloths, etc. used in conjunction with the Work.



- C. Contractor shall not bring or allow or permit to be brought onto the Premises any hazardous, toxic or petroleum material substance not required for the Work. Contractor shall not dispose of or release onto or from the Premises any hazardous, toxic or petroleum material, substance, or waste. Compliance with all environmental laws shall be Contractor's sole responsibility at its sole cost. Contractor shall immediately furnish to the Executive Director written notice of any and all releases of hazardous wastes, materials or substances whenever such releases are required to be reported to any federal, state or local authority, and pay for all clean up and removal costs. Such written notice shall identify the substance released, the amount released, and the measures undertaken to clean up and remove the released material and any contaminated soil or water, and shall further certify that no contamination remains. Contractor shall also provide Commission with copies of any and all reports resulting from tests on Airport Property or made to any governmental agency, which relate to Airport property.
- D. Regardless of Commission's acquiescence and in addition to indemnification provisions contained elsewhere in this Agreement, Contractor shall defend, indemnify, and hold Commission its officers, officials, board members, agents, and employees, harmless from all costs, liabilities, fines or penalties, including attorney's fees, resulting from or arising out of violation of this section and agrees to reimburse said parties for any and all costs and expenses incurred in eliminating or remedying such violations. Contractor further covenants and agrees to reimburse Commission and hold Commission its officers, agents and employees harmless from any and all costs, expenses, attorney's fees and all penalties or civil judgments obtained against the Commission as a result of Contractor's use, release or disposal of any petroleum product, hazardous substance, material, or waste onto the ground or into the water or air. Contractor agrees to waive any and all statutes of limitations applicable to any controversy or dispute arising under this section and Contractor further agrees that it will not raise or plead a statute of limitations defense in any action arising out of Contractor's failure to comply with the provisions contained in this section.
- E. Any water used in construction operations or used to cleanup construction debris shall not be allowed to enter the storm drainage system. All such water shall be collected, filtered, and disposed of offsite in a safe, legal manner

**26. Source of Supply and Quality Requirements**

The materials used on the Work shall conform to the requirements of the Contract Documents.

Unless otherwise indicated, it is understood and agreed that any item offered or shipped by the Contractor shall be in NEW AND FIRST CLASS CONDITION, that all containers shall be new and suitable for storage or shipment, and that prices include standard commercial packaging or preparation and delivery costs for the items shipped.

All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, or fabricator, except as otherwise specifically provided in the Contract Documents.

**27. Inspection of the Work**

All materials and each part or detail of the Work shall be subject to inspection by the Consultant. The Consultant shall be allowed access to all parts of the Work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Consultant requests it, the Contractor, at any time before acceptance of the Work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the Work to the standard required by the specifications. Should the Work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as Extra Work; but should the Work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

**28. Tests and Inspections**

Tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Consultant timely notice of when and where tests and inspections are to be made so that the Consultant may be present for such procedures.

If the Consultant, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not required by the preceding paragraph, the Consultant will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Consultant of when and where tests and inspections are to be made so that the Consultant may be present for such procedures. Such costs, except as provided in the following paragraph, shall be at the Owner's expense.

If tests, inspections, or approvals reveal failure of portions of the Work to comply with requirements of the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Consultant's services and expenses shall be at the Contractor's expense.

**29. Unacceptable Materials**

Any material or assembly or method of removal or installation that does not conform to the requirements of the Contract Documents shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the Work, unless otherwise instructed by the Consultant.

No rejected material or assembly, the defects of which have been corrected by the Contractor, shall be returned to the site of the work until such time as the Consultant has approved its use in the work.

**30. Removal of Unacceptable and Unauthorized Work**

All Work which does not conform to the requirements of the Contract Documents will be considered unacceptable, unless otherwise determined acceptable by the Consultant as provided in the subsection titled CONFORMITY WITH DRAWINGS AND SPECIFICATIONS, Subsection 5 of these General Conditions.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the Subsection 20 titled CONTRACTOR'S RESPONSIBILITY FOR WORK of these General Conditions.

Work done contrary to the instructions of the Consultant, work done beyond the lines shown on the Plans or as given, except as herein specified, or any extra work done without an executed change order, will be considered as unauthorized and will not be paid for under the provisions of the Contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Consultant made under the provisions of this subsection, the Consultant will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct and/or offset the costs (incurred by the Owner) from any monies due or to become due the Contractor.

31. **Partial Acceptance**

If at any time during the prosecution of the project the Contractor fully completes a usable unit or portion of the Work, the occupancy of which will benefit, or is required by, the Owner, it shall request the Consultant to make final inspection of that unit. If the Consultant finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, he may accept it as being completed; provided that such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract, nor shall it start any warranty period prior to the entire Project being accepted.

Reference is made to Subsection 2, TIME OF COMPLETION, NOTICE TO PROCEED AND LIQUIDATED DAMAGES, in these General Conditions and to Sections 3, TERM, and 4, CONTRACT SUME AND LIQUIDATED DAMAGES, of the Contract.

32. **Final Acceptance**

Upon due notice from the Contractor of presumptive completion of the entire project, commonly referred to as Substantial Completion, the Consultant and Owner will make an inspection.

If all construction provided for and contemplated by the Contract is found to be completed in accordance with the Contract Documents, including, without limitation, drawings, supplementary drawings, and specifications, such inspection shall constitute the final inspection, and the Owner shall notify the Contractor in writing of Final Acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Contractor shall proceed to correct the unsatisfactory work, commonly referred to as the "punch list", within fourteen (14) consecutive calendar days. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the Consultant will make the Final Acceptance and notify the Contractor in writing of this acceptance as of the date of the final inspection. **Final Acceptance shall be achieved within the Contract Time (refer to Subsection 20 and Subsection 41 of these General Conditions).**

If the Consultant is required to conduct more than the two (2) final inspections outlined above, the charges for the Consultant's services associated with such additional inspections shall be deducted and/or offset by the Owner from the Contractor's final payment for the project.

### **33. Contractor's Warranties**

The Contractor expressly warrants that all aspects of the Work shall be of good and merchantable quality and fit for the particular purpose for which intended. In addition to and not in lieu of any other warranties, express or implied, the Contractor expressly warrants and guarantees the Work against defects or deficiencies in all material and workmanship and shall maintain, repair or replace, solely at its own cost and expense including, without limitation, any cost of labor, materials or travel, any work that is found by the Owner to be defective, within a period of one (1) year from the date of Final Acceptance of the Work.

The establishment of the time period of one (1) year after Final Acceptance relates only to the specific Contractual obligation of the Contractor to correct the Work, and has no relationship to and is in addition to and not in lieu of any manufacturer's warranty, the time within which Contractor's obligations to comply with the Contract Documents may be sought to be enforced, nor the time within which proceedings may be commenced to establish the Contractor's liability with the respect to any of its obligations other than specifically to correct the Work.

If the Contractor, after notice, fails to proceed promptly to comply with the terms of the express warranty contained in these General Conditions, the Owner may have the defects corrected and the Contractor and its Surety shall be liable for all expense incurred.

This warranty shall be in addition to and not in lieu of any and all other applicable and required warranties, as specified in these contract documents, including, without limitation, manufacturer's, special, express or implied warranties.

### **34. Subletting of Contract**

Contractor shall not assign this Contract nor any of its rights or duties hereunder, nor shall Contractor subcontract any of the Work hereunder, without the prior written consent of the Owner's Executive Director. In the event of authorized assignment or subcontracting, the Contractor shall file copies of all assignments and subcontracts with the Owner.

The Owner will not recognize any subcontractor on the Work. The Contractor shall at all times, when work is in progress, be represented either in person or by a qualified superintendent or foreman from its staff. The qualified representative shall be duly authorized to receive and execute orders of the Owner and/or Consultant.

The Contractor may only replace or add subcontractors with the prior written consent of the Owner.

Upon Owner's request(s), Contractor shall provide a listing of all subcontractors for the projects, including name, contact, address, phone, work to be performed, contract price, and amount actually paid.

**35. Certificate for Payment**

- A. Before submittal of the first partial payment request under the Contract, the Contractor shall prepare for review and approval of the Consultant and the Owner, a schedule of the estimated values listed by trades or by specification sections of the Work, totaling the Contract Price. Where the total project has multiple parts or phases, the Contractor shall prepare appropriate schedules of values to facilitate reviews and justifications for payments.
- B. The "Value of Work Completed" portion of the form shall be completed, the Contractor's certification completed and signed, and the appropriate substantiating material attached to each Certificate for Payment.
- C. The labor progress for any task or activity shall be calculated upon the percentage of Work complete up to fifty percent (50%) of the completion of the task or activity. Thereafter, the evaluation of labor progress will be based upon the effort required to complete that task or activity. The material progress shall be calculated as the invoiced dollar cost of materials used in relationship to the amount estimated as necessary to complete a particular element of Work. When calculating material progress, credit shall be given for installed material which has been certified by the Engineer.
- D. Should Work included in previous submittals, and for which payment has been made, subsequently be identified, by tests, inspection, or other means, as not acceptable or not conforming to Contract requirements, the "Value of Work Completed" portion of the first form submitted after such identification shall be modified to reduce the "completed" value of that work by deleting the value of that which has been identified as not acceptable or nonconforming.

**36. Payment to Contractor**

PROGRESS PAYMENTS: Unless otherwise provided by the Contract Documents and based upon Certificate for Payment form approved by and submitted to the Consultant by the Contractor and upon a Recommendation for Payment issued by the Consultant, the Owner shall make Progress Payments to the Contractor on account of the Contract Sum not later than the last day of the succeeding calendar month for all Work satisfactorily performed under and in accordance with the requirements of this Contract during the preceding monthly period ending on the 25th day of the preceding month. The Contractor's Certificate for Payment shall be submitted to the Consultant not later than the first day of each month, who shall, if it approves the same, issue to the Owner, with copy to the Contractor, a

Recommendation of Payment thereon. To insure the proper performance of this Contract, the Owner shall retain five percent (5%) of the amount of each approved Certificate for Payment until all of the Work provided for in the Contract Documents is fully completed, as determined by Consultant and Owner, and Owner has issued final acceptance of the Work.

The preparation, submission and approval of all Certificates for Payment and Recommendation for Payment shall be in accordance with the provision of the Contract Documents.

FINAL PAYMENT. Final payment, constituting the entire unpaid balance of the Contract Sum, but less such sum to which the Owner is entitled pursuant to the Contract Documents as liquidated damage for delay in timely completion of the work or damages/costs pursuant to Section 5 of the Contract, shall be paid by the Owner to the Contractor within thirty (30) days after completion of the Work, provided the Work has been fully and satisfactorily completed, the Contract duly performed, Final Acceptance has occurred, the Lien and Claims Release and the Warranty of Construction forms have been completed and submitted by Contractor, a Certificate for Payment marked "Final," has been issued by the Consultant, and the Owner's Executive Director has accepted in writing all said work.

A separate request for payment of all sums retained by the Owner is required upon approval of Final Payment.

Prior to receiving any payments under this Contract, if the Contractor is an individual, the Contractor shall provide their social security number to the Owner and if the Contractor is a proprietorship, partnership, or corporation, the Contractor shall provide its federal employer identification number to the Owner.

### **37. Payments to Subcontractors**

If Contractor has used any subcontractor to perform work required under the Contract Documents, Contractor must take one of the following actions within seven (7) days after receipt of the amount paid to Contractor by Owner for work performed by the subcontractor:

- A. Pay the subcontractor for the proportionate share of the total payment received from the Owner attributable to the work performed by the subcontractor under that contract; or
- B. Notify the Owner and subcontractor, in writing, of Contractor's intention to withhold all or part of the subcontractor's payment with the reason for nonpayment.

Contractor agrees to pay interest to subcontractor on all amounts owed by Contractor that remain unpaid after seven (7) days following receipt by Contractor of payment for Owner for work performed by subcontractor, except for amounts

withheld pursuant to subparagraph (b) above. Interest on the unpaid amount will accrue at the legal rate.

Contractor agrees to include in each of its subcontracts a provision requiring each subcontractor to be subject to the same payment and interest requirements with respect to each lower-tier subcontractor.

The Contractor agrees that it shall defend, indemnify, and hold the Owner harmless for any lawful claims caused by failure of the Contractor to make prompt payments to all persons supplying it equipment, labor, tools or materials in prosecution and completion of the Work provided for in the Contract. In the event of such claims, the Owner may, after providing written notice to the Contractor, withhold from any progress and/or Final Payment the unpaid sum of money deemed sufficient to pay all lawful claims and associated costs in connection with the Contract.

**38. Claims for Adjustment and Disputes**

**See Section 39. below.**

**39. Claims by Contractor**

A. **CONTRACTOR CLAIMS TO ENGINEER FOR CHANGE ORDERS.** If for any reason the Contractor deems that additional compensation or other relief is due it, including, without limitation, work or materials not clearly provided for in the Contract, drawings, or specifications, or not previously authorized as extra work, or inadequate time for additional work, it shall notify the Engineer in writing, attaching all supporting documentation/date, of its intention to request such change order for additional compensation or time, within ten (10) calendar days of notice of the occurrence giving rise to the claimed change. Any and all such claims by Contractor for additional compensation or other relief shall be submitted first to Engineer in accordance with the provisions of this Section. The Contractor shall not begin such work or incur the expense for such materials until it receives a prior written change order executed by the Owner. If such notification is not given, or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional relief or compensation. Such notice by the Contractor and the fact that the Engineer has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. If Contractor submits its request for the claimed change order within ten (10) calendar days of notice of the occurrence giving rise to the need for the claimed change, and if Engineer should deny Contractor's request for the claimed change order or additional compensation or completion time, any claim by Contractor with Owner shall be filed in accordance with the requirements of Section B below. Nothing in this subsection shall be construed as granting Contractor a right to dispute



final payment based on actual differences from Contractor's original estimates of measurements or computations.

- B. **CONTRACTOR CLAIMS TO OWNER.** Contractual claims, disputes and other matters relating to the acceptability of the work, the interpretation or the requirements of the Agreement, or the performance or furnishing of the work, including without limitation, Engineer's denial of Contractor's request for a change order for additional money and/or an increase in time, shall be submitted in writing together with all supporting documentation/data and a request for a formal decision to the Owner's Executive Director. Contractor shall deliver the written notice with supporting data for each such claim, dispute or other matter promptly, but in no event later than ten (10) calendar days after the start of the occurrence of the event giving rise to the claim. Contractor's failure to submit written notice of such claim, dispute or other matter with the supporting data to Owner's Executive Director within the time specified shall be deemed to be and shall constitute a waiver by Contractor of any and all claims for such matters and shall be an absolute bar to any future claim or suit against Owner for damages or relief of any kind based upon such occurrence or event. In reviewing any such claim or dispute, Executive Director may request any additional information or documentation from Contractor or other parties and may utilize appropriate assistance from other sources. Any final decision in writing by the Executive Director shall be issued to Contractor within ninety (90) calendar days from the later of: i.) receipt of the written claim; or ii.) receipt of any additional information requested from the Contractor. Failure of the Executive Director to render a decision within ninety (90) calendar days shall be deemed a final decision by the Roanoke Regional Airport Commission denying the claim, and shall not result in the Contractor being awarded the relief claimed or in any other relief or penalty.

#### 40. **Acceptance and Final Payment**

When the Contract Work has been accepted in accordance with the requirements of Subsection 32 FINAL ACCEPTANCE of these General Conditions, and the required documents (e.g. Release of Liens and Claims, Warranties, marked up drawings and/or record drawings, etc.) have been received by Consultant, the Consultant will approve Contractor's invoice for payment and submit it to Owner for processing and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Subsection 39 CLAIMS BY CONTRACTOR of these General Conditions, such

claims will be considered by the Owner in accordance with local laws or ordinances and the provisions of this Contract. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

41. **Determination and Extension of Contract Time**

The number of calendar days allowed for completion of each Phase of the Work shall be stated in the Contract Documents and shall be known as the CONTRACT TIME. CONTRACT TIME based on CALENDAR DAYS shall consist of the number of calendar days stated in the Contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days.

Should the Contract Time require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

- A. Weather Related: The number of calendar days specified in the Contract for performance of the Work includes an allowance for 80 percent of the one hundred twenty (120) calendar days being available for productive work.

The Contractor may request an extension in contract time, if the available days for productive work (including all Saturdays, Sundays, and holidays) are less than 80 percent of the established contract time. The contract time will be extended until the allowed number of available productive days is achieved.

A day will be considered available for productive work, irrespective of whether the Contractor actually worked or not, if, in the Consultant's opinion, the Contractor could have been able to proceed with a principal work item for at least a 4-hour work period. The Contractor shall notify the Consultant within five calendar days, in writing or by fax, if it considers a particular day not available for productive work in at least a 4-hour work period.

**The Contractor shall keep a daily record of weather conditions noting days and hours which are not available for work in accordance with the above criteria. Such records shall be provided to the Engineer on a weekly basis. Failure to provide such records will void any potential claims for Contract Time extensions due to weather.**

- B. Other Causes: If the Contractor finds it impossible for reasons beyond its control to complete the Work within the Contract Time as specified, or as extended in accordance with the provisions of a written change order, it shall within five (5) calendar days of any occurrence claimed as the basis for the need for a change, make a written request to the Consultant for a change order with an extension of time setting forth the reasons which it believes will justify the granting of its request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Consultant finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, it may recommend that the Owner extend the time for completion in such amount as the conditions justify. Upon the Owner's concurrence and authorization as evidenced by a written change order, the extended time for completion shall be in full force and effect, the same as though it were the original time for completion.

Failure to provide written notice at the inception of the event giving rise to the need for a time extension within the time limits imposed in this Subsection will be deemed a waiver of any claim for time extension.

All calendar days elapsing between the effective dates of the Consultant's order to suspend and resume all work, due to causes not the fault of the Contractor, shall not be counted against the Contract Time. Charges against the Contract Time will cease as of the date of final acceptance as determined by the Consultant and Owner.

#### 42. **Failure to Complete on Time**

It is mutually agreed between Contractor and Owner that time is of the essence in the performance of the Contract, and that in the event all Work required under the Contract is not fully and satisfactorily completed within the times specified, (including all extensions and adjustments as provided in Subsection 41 DETERMINATION AND EXTENSION OF CONTRACT TIME of these General Conditions, it is agreed that the Contractor and its Surety shall owe Owner and Owner may retain, deduct, and/or offset from money to be paid Contractor, the sum set forth in the Contract for each calendar day that the Work remains incomplete, not as a penalty, but as the parties' reasonable agreement of liquidation of a reasonable portion of damages that will be incurred by Owner by failure of Contractor to complete the Work with the time stipulated. Contractor covenants and agrees that the actual damages that may result from failure to complete the Work within the time required under the Contract are uncertain and difficult to determine with exactness and that the amount fixed in the Contract is not out of proportion to the probable loss. Contractor further covenants and agrees that: (a) the actual damages that may result from failure to complete the work within the time specified are uncertain and difficult to determine with exactness and that the amounts fixed as liquidated damages herein are not out of proportion to the

probable loss; (b) Owner retains the right to make such retentions, deductions and/or offsets for liquidated damages at any time and that Owner's imposition and the retention, deduction and/or offset of any liquidated damages hereunder shall not be subject to any prior notice or claim requirements; and, (c) **Contractor waives any defenses as to the validity of any liquidated damages provisions in this Contract based on such liquidated damages being void as penalties or not being reasonably related to actual damages.** It is further agreed, however, that application of liquidated damages hereunder shall not be Owner's exclusive remedy and shall not bar any other claim, cause of action, or remedy that Owner may have against Contractor under applicable law in the performance of this Contract.

Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall in no way operate as a waiver on the part of the Owner of any of its rights under the Contract. It is understood that the foregoing provisions shall not limit the right of the Owner to declare a breach of Contract, and in such event, the liability of the Contractor, including liability for such liquidated damages, shall continue.

#### 43. **Default and Termination of Contract**

The Contractor shall be considered in default of its Contract and such default will be considered as cause for the Owner to terminate the Contract for any of the following reasons. If the Contractor:

- A. Fails to begin the Work under the Contract within the time specified in the "Notice to Proceed";
- B. Fails to perform the Work or fails to provide sufficient workers, equipment or materials to assure completion of work in accordance with the terms of the Contract;
- C. Performs the Work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable;
- D. Discontinues the prosecution of the Work;
- E. Fails to resume work which has been discontinued within a reasonable time after notice to do so;
- F. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency;
- G. Allows any final judgment to stand against it unsatisfied for a period of 10 days;

- H. Makes an assignment for the benefit of creditors; or
- I. For any other cause whatsoever, fails to carry on the Work in an acceptable manner, or comply with any Contract term.

Should the Owner consider the Contractor in default of the Contract for any reason stated hereinbefore, including, without limitation, delay, neglect or improper prosecution of the Work, then the Owner shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the Contract.

If the Contractor or Contractor's surety, within a period of 10 days after such notice, does not proceed to correct the cause for such notice, then the Owner shall, upon written notification from the Consultant of the facts giving rise to such notice and/or the Contractor's failure to comply with such notice, have full power and authority without violating the Contract, to declare the Contractor in default and to take the prosecution of the Work out of the hands of the Contractor. However, in the event that that Contractor's failure is a violation of law, or an act or condition that poses a risk of harm to people or their property, then Contractor shall immediately take action to cure such failure and shall complete such cure within 24 hours or risk being declared to be in default of the Contract. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the Work and are acceptable and may enter into an agreement for the completion of the Contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Consultant will be required for the completion of the Contract in an acceptable manner.

In the event that Contractor defaults in the performance of any of the terms, conditions or agreements contained in this Contract, and Owner places the enforcement of all or part of this Contract in the hands of an attorney, including the filing of a suit upon the same, Contractor agrees to pay all of Owner's reasonable attorney's fees and any costs related to any such proceeding. *All costs and charges incurred by the Owner, together with the cost of completing the Work under Contract, may be deducted, retained, and/or offset from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the surety shall continue to be liable and shall pay to the Owner the amount of such excess.*

#### **44. SPECIAL CONDITIONS**

##### **A. COOPERATION BETWEEN CONTRACTORS**

The Owner reserves the right to contract for and perform other or additional work on or near the Work covered by this contract. Separate contracts involving multiple Contractors may be underway simultaneously in, around

and/or near several portions of the Work area. Contractor will be required to attend daily coordination meetings with other Contractors and Owner at the direction of the Owner's representative.

When separate contracts are let within the limits of any one project, each Contractor shall conduct its work so as not to interfere with or hinder the progress of completion of the Work being performed by other Contractors. Contractors working on the same project shall cooperate with each other to the maximum extent feasible to avoid conflicts and all conflicts shall be brought to the Engineer's attention as soon as possible.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with its contract and shall protect and save harmless the owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by him because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange its work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same project. It shall join its work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

## **B. DAILY COORDINATION MEETINGS – CONTRACTOR DUTIES**

1. Participate in brief daily coordination meetings with Owner and any on-site representative of Consultant to advise Owner of that day's intended construction activities.
2. Time: Conduct meeting at beginning of each work day, at time mutually agreed upon by Owner and Contractor.
3. Location: As mutually agreed upon by Owner and Contractor.
4. Required Attendees:
  1. Owner's Project Coordinator or designated representative.
  2. Contractor's superintendent.
  3. Appropriate subcontractors.
  4. Representatives of other contractors working on Airport projects.
  5. Tenant Representatives affected by the current day's work-
5. Agenda: Discuss and coordinate the following:

1. Areas in which the (next) day's work will be conducted.
  2. Nature of work to be conducted.
  3. Scheduled deliveries.
  4. Access and Security issues.
  5. Tenant operational issues.
  6. Work/Projects being undertaken in the Airport by other contractors and coordination of all projects.
6. Do not work outside areas approved at daily meeting without prior notification to and approval by Owner's representative.

### **C. CONTINUOUS USE OF AIRPORT FACILITIES**

The Owner will maintain continuous, normal use of any and all surrounding areas during any construction operations. All existing Owner facilities, aircraft, and personnel and the general public in surrounding areas shall be protected.

Damage resulting from Contractor's operations shall be immediately repaired by Contractor or, at Owner's discretion, repaired by the Owner. The Contractor shall be responsible for the cost of such repairs. Cost will be deducted from payments made to the Contractor.

Contractor shall take every precaution to prevent fumes, noxious odors, preparation materials and debris from entering the building and affecting or harming persons, aircraft and/or vehicles. Contractor shall also take action to prevent excessive noise. Should odors or noise be deemed excessive by the Owner, the Contractor shall be ordered to cease work immediately until the problem can be corrected to the Owner's satisfaction.

### **D. ON-SITE SAFETY**

The Contractor is responsible for all aspects of onsite safety while performing the Work.

### **E. WORK PHASING RESTRICTIONS**

The phasing of construction shall proceed at the option of the contractor after the Construction Schedule approval by Owner and Engineer.

## F. AIRPORT SAFETY REQUIREMENTS DURING CONSTRUCTION

- 1 GENERAL SAFETY REQUIREMENTS. During performance of this Contract, the Airport runways, taxiways, and aircraft parking aprons shall remain in use. The Contractor shall not allow employees, subcontractors, suppliers, or any other unauthorized person to enter or remain in any airport area that would be hazardous to persons or to aircraft operations.
  
- 2 CONSTRUCTION AND FACILITIES MAINTENANCE. The Contractor shall be aware of and take all precautions necessary to avoid the following types of airport safety problems and hazards during construction:
  - (1) Trenches, holes, or excavations on or adjacent to any open runway or in safety areas.
  - (2) Mounds or piles of earth, construction materials, temporary structures, or other objects in the vicinity of any open runway, taxiway, taxilane or in a related safety, approach, or departure area.
  - (3) Pavement drop-offs or pavement-turf lips (either permanent or temporary) which could cause, if crossed at normal operating speeds, damage to aircraft that normally use the airport (the normal maximum is 3 inches for either).
  - (4) Vehicles or equipment (whether operating or idle) on any open runway, taxiway, taxilane, or in any related safety, approach, or departure area.
  - (5) Vehicles, equipment, excavations, stockpiles, or other materials which could degrade or otherwise interfere with electronic signals from radios or electronic navigational aids.
  - (6) Unmarked utility, navaid, weather service, runway lighting, or other power or signal cables that could be damaged during construction.
  - (7) Objects(whether marked or flagged or not) or activities anywhere on or in the vicinity of the airport which could be distracting, confusing, or alarming to pilots during aircraft operations.
  - (8) Unflagged/unlighted low visibility items (such as tall cranes, drills and the like)anywhere in the vicinity of active runways, or in any approach or departure area.
  - (9) Misleading or malfunctioning obstruction lights.



- (10) Unlighted/unmarked obstructions in the approach to any open runway.
- (11) Inadequate, confusing, or misleading (to user pilots) marking/lighting of runways, taxiways, taxilanes (including displaced or relocated thresholds).
- (12) Trash or other materials with foreign object damage (FOD) potential, whether on runways, taxiways, or aprons, or in related safety areas.
- (13) Failure to control vehicle vehicle, human, and large animal access to, and nonessential non-aeronautical activities in, open aircraft operating areas.
- (14) Failure to maintain radio communication between construction/maintenance vehicles and air traffic control tower or other on-field communications facility, e.g., FAA Flight Service Station (FSS) or Unicom radio.
- (15) Construction activities or materials which could hamper crash-fire-rescue (CFR) vehicle access from the Aircraft Rescue and Firefighting (ARFF) station to all parts of the runway/taxiway system, to runway approach and departure areas, and to aircraft parking locations.
- (16) Bird attractants such as edibles (food scraps, etc.) or other miscellaneous garbage, other trash, or ponded water on airport.
- (17) See other sections of these contract documents for additional related safety, security and operational requirements.

The Contractor shall also conduct activities so as not to violate any safety standards herein and shall inspect all construction and storage areas as often as necessary to be aware of conditions, and promptly take all steps needed to prevent/remedy any unsafe or potentially unsafe conditions/activities discovered.

Before actual commencement of construction activity, Contractor shall (through the Office of the Director of Operations and Maintenance, and the Engineer) give notice using the Notice to Airmen (NOTAM system) of proposed time and date of commencement of construction in such areas.

Upon completion of work and return of all such areas to standard conditions, Contractor shall (through the office of the Director of Operations and Maintenance and the Engineer) issue notice (using the NOTAM system) of completion of construction.

3. CONSTRUCTION AREA MARKING. Flaglines, traffic cones, flashers, and/or signs shall be used as necessary:

- (1). To clearly separate all construction/maintenance from other parts of air operations area,
- (2). To identify isolated hazards, such as open manholes, excavations, areas under repair, stockpiled material, waste areas, etc., and
- (3). To identify FAA, airport, and National Weather Service facilities, cables, power lines, ILS critical and other sensitive areas.

All barricades, temporary markers, flagline supports, and other objects placed/left in safety area of any open runway, taxiway, or taxilane shall be:

- (1). As low as feasible;
- (2). Of low mass;
- (3). Easily collapsible if impacted by an aircraft or component thereof;
- (4). Weighted down or attached to surface to reduce chance of movement by prop wash/jet blast/wing vortex or other wind currents; and
- (5). If affixed to the surface, frangible at ground level.

4. OTHER MARKING AND LIGHTING. Objects (whether fixed or mobile) above runway elevation that penetrate the applicable runway approach surface described in FAA Part 77.25, Paragraph (d), may be hazardous to aircraft operations. Construction/maintenance-related objects such as stockpiled materials or equipment within these distances may need airspacing and shall be marked with orange and white flags or paint and, if nearest runway is used at night, be well illuminated and/or obstruction lighted.

5. CONTRACTOR'S RESPONSIBILITY FOR NAVIGATIONAL AIDES. The following statements concerning FAA cables and FAA NAVAID equipment shall apply to this project.

- (1) The local FAA Airway Facilities Sector Field Office (AFSFO) personnel will, upon notification, mark all FAA cables in the vicinity of construction once, prior to the start of work. The Contractor shall be responsible for any damage to cables within three feet of the marked cable route. Should it damage any cables, it shall immediately notify the Air Operations Office and take all steps necessary for the repair of the cable. If the repair necessitates any work on

the part of the local FAA personnel, the Contractor will be billed for all costs incurred.

- (2) The Contractor shall minimize, as much as possible, locations where haul routes will cross earth buried FAA cable. At such crossing points, the cable must be protected with steel boiler-plate or a similar structural device.
- (3) At times when either a runway threshold is displaced or equipment is operating in an ILS clear zone, then the affected ILS must be taken off the air. Also, when equipment is operating between a localizer antenna and its associated landing threshold, the localizer must be taken off the air. The work must be closely coordinated with the local AFSFO to eliminate unnecessary shutdowns.
- (4) When work is to be done in the vicinity of FAA cables, said cables shall be physically located by hand-digging and exposing the cables thru the full length of the construction zone. FAA cables shall be protected. No work shall be performed over direct earth buried FAA cable without first protecting the cable with steel boiler-plate or similar structural devices.

The Contractor shall not conduct any construction activity within the navigational aids (i.e., ILS components, VOR, ASR, ATCT) restricted areas shown on the plans without prior approval from the local FAA Airway Facilities Sector and the Engineer.

## 6. LIMITATION ON CONSTRUCTION.

- (1). Open-flame welding or torch-cutting operations are prohibited unless adequate fire and safety precautions are provided and have been approved by the Airport Owner. All vehicles are to be parked and serviced behind the building restriction line and/or in an area designated by the airport operator.
- (2). Open trenches, excavations and stockpiled material at the construction site shall be prominently marked with red flags and lighted by light units (acceptable to the Airport Owner and the FAA) during hours of restricted visibility and/or darkness. Under no circumstances are flare pots to be used for airport lighting.
- (3). Stockpiled material shall be constrained in a manner to prevent movement resulting from aircraft blast or wind conditions. Material shall not be stored near aircraft turning areas.

## 7. MARKING AND LIGHTING OF CLOSED HAZARDOUS AREAS ON AIRPORTS.

When areas on the Airport are closed or present hazards due to construction activities, they shall be marked and lighted according to paragraph 10 of AC 150/5340-1, "Marking of Paved Areas on Airports., current edition.

8. **COORDINATION AND COMMUNICATIONS.** The Contractor shall keep the Engineer apprised of its scheduled construction activities in order to allow proper notification of the Owner, its airport management and airport operators. Daily meetings to discuss construction progress and location shall be required.

The Contractor shall have a functioning two-way radio at the job site at all times work is in progress to monitor ground control frequency 121.9 when in operation. Contractor's superintendent shall also have a cellular phone on him and at the site. In the event that the air traffic control tower should be closed during a portion of the nighttime hours, during such closure the Contractor shall keep in radio communication with the Common Traffic Advisory frequency (118.3 MHZ). In addition, Contractor shall comply with all communication requirements specified in this Section.

9. **DEBRIS.** Waste and loose material capable of causing damage to aircraft landing gears/ propellers or being ingested in jet engine, shall not be placed or permitted on active aircraft movement areas. Material tracked or blown on these areas shall be removed continuously during the work project.
10. **TRASH RECEPTACLES.** In accordance with Virginia's Anti-litter Law and the safety of aircraft operations, receptacles sufficient to contain worker's litter and construction wastes capable of being spread by wind or water shall be located on the construction site. The number and size of receptacles required shall be determined by the Contractor, subject to the additional requirements of the Engineer.
11. **DUST CONTROL.** The CONTRACTOR is advised that aircraft storage and aircraft maintenance operations are conducted adjacent to the project. Special attention to dust control will be required during the course of the project. The use of water and calcium chloride shall be anticipated. The Engineer reserves the right to halt work or hauling in non-conforming areas, if corrective actions are not promptly taken by the CONTRACTOR to control dust.
12. **AIRCRAFT OPERATIONS.**

- (1) It is the intent of the Owner to minimize interference with aircraft operations. The Contractor shall coordinate its activities while working near the aircraft operational area, so as to create minimal interference with aircraft operations. Before starting its operations at any location on the airport, the Contractor shall assure proper safety precautions and separations in accordance with the Plans, this Section and other applicable sections of these bid documents. Construction-related activities must maintain adequate horizontal and vertical clearance from active operational aircraft areas.

- (2) When working on the airfield, safety is of paramount importance. Vehicles

and personnel must give way to emergency equipment and moving or parked Aircraft at all times.

- (3) Prior clearance must be obtained from the Director of Operations and Maintenance for any movement in the AOA (secured portion of the airport). For isolated or temporary AOA entries, a minimum of twenty-four (24) hours notice is required.
- (4) All vehicle movements within the AOA shall be controlled and/or escorted by personnel assigned by the Contractor who have been trained and specifically authorized to drive within the AOA and who are equipped with two-way radio capable of communicating with the FAA Control Tower.
- (5) A Runway, Taxiway, Apron, or any portion thereof, can be closed to aircraft movements if weather conditions and/or safe aircraft operations permit re-routing operational aircraft to other areas. During such periods, all ground personnel and equipment may move freely within the "closed" area; however, clearances to "active" areas must be strictly observed. An airfield area "closed" to aircraft operations must be NOTAMed, marked and lighted in accordance with specific standards.
- (6) A change of weather conditions, an emergency, or a change in the overall safe operational status of the airfield may be cause for the Director of Operations and Maintenance to order any or all personnel and equipment to immediately vacate any designated airfield area, including "closed" areas, without liability to the Commission.
- (7) Prior to closing or restricting, either horizontally or vertically, the use of any portion of the airfield to operational aircraft, all airfield users will be briefed of the proposed action, sufficiently far in advance to adjust schedules and maintain uninterrupted, near normal airfield operations. All such proposed actions will be coordinated through the Engineer and approved by the Airport Director of Operations and Maintenance.
- (8) At the completion of each work day or night work session, any and all areas of construction activity within the Air Operations Area (AOA) shall be left in an "Operational Condition" as defined in Sections 24 of the General Provisions.

### 13. AIRPORT SECURITY.

- (1) Timing of Access: The Owner will provide site access to the Contractor only after the Contractor's employees have received the required safety/security training and security clearance from the Owner. Depending upon the type and location of work to be performed, and only upon the prior specific written authorization of Owner, the Contractor may be permitted to

badge only the superintendent, foremen, access guards, escorts, crossing guards, etc. In such case, the Contractor must arrange for badging any person who works independently (i.e., qc testing technicians, etc.) and all other employees may be permitted access by and at all times under escort by a properly authorized badged escort.

The Contractor shall insure that a sufficient number of personnel granted unescorted access are available to escort any non-badged personnel who may be permitted access to a Security Restricted Area by Commission.

Badged personnel shall anticipate 2.5 hours of safety/security/driver training. All other employees shall anticipate 1 hours of safety/security training.

- (2) Access Gates and Guards: The CONTRACTOR shall use only authorized access points into and within the airfield for the respective work areas and only those haul routes designated by the OWNER. Once the necessary points of access are agreed upon, the Contractor may be required to execute a gate agreement substantially in accordance with the Gate Agreement Form contained in the Contract Documents. CONTRACTOR is responsible for ensuring that all employees of the CONTRACTOR and subcontractors use only the authorized access points and routes to and within the airfield for the respective work areas and verifying that the access points are secure immediately after use or continuously controlled by a badged and trained access guard. The Contractor shall provide a guard or such other person to man the gate, check for proper identification, and be responsible for ensuring that no unauthorized personnel and/or vehicles gain access or enter the secured area of Roanoke Regional Airport through access points for which the Contractor is responsible per a signed Gate Agreement. Responsibility for these actions shall continue until terminated in writing by the Commission.

Gates that fail to secure must be immediately reported to the airport security division. The airport is subject to TSA security requirements and rigid adherence is mandatory. Any fines resulting from unauthorized personnel entering through the CONTRACTOR'S access point or any other security violation by Contractor, its employees and subcontractor's, will be deducted from money due the CONTRACTOR. A security violation may result in the immediate suspension of the security badge and the denial of further access to the project by the violator(s).

- (3) Itinerant Workers or Suppliers: Personnel and/or suppliers requiring only occasional access to the site may be exempt from the safety/security/driver training requirements provided they are under the direct supervision (within approximately 100 feet) of an appropriately badged escort. Vehicle convoys of no more than two vehicles shall be permitted. Escorted vehicles are not exempt from the marking requirements.

- (4) Maintaining Perimeter Fence Line: The CONTRACTOR shall maintain the perimeter fence on a continuous basis with any temporary opening being continuously observed by the CONTRACTOR'S badged and trained access guard. All temporary openings shall be secured at the completion of each day's work.
  - (5) Delineation of Project Safety/Security Area: The CONTRACTOR shall delineate limits of construction with safety fence prior to beginning work each day. None of the CONTRACTOR'S personnel should be beyond the limits of construction without authorization from airport personnel. Violators are subject to removal from the jobsite and loss of the identification badge and/or working privileges inside the airfield area.
  - (6) Security Plan: The Contractor shall submit a security plan two weeks prior to the pre-construction conference. The security plan shall outline the methods and means that the CONTRACTOR intends to apply in order to maintain airport security.
    - (i) Additional Security Information: Additional information regarding security items is available through the Chief of Safety and Security at (540) 362-1999.
14. VEHICULAR ACCESS. All of vehicles of Contractor and subcontractors entering AOA shall have the company name on both sides of the vehicles using letters eight inches or greater in height. Contractor may also be required to affix a Commission issued vehicle decal to each such vehicle.
- All persons driving such vehicles shall be trained and specifically authorized/badged to drive inside the security fence in an area where aircraft are operating, or be escorted by an employee of Contractor who has been so trained.
15. CONSTRUCTION FLAGS. The Contractor shall furnish aircraft warning flags in aeronautical areas, colored orange and white, three feet (3') by three feet (3') in a checkerboard pattern for equipment and flagmen use. Flags on equipment shall be mounted on a staff not less than eight feet (8') in length. Each truck or other piece of equipment of the Contractors shall have attached to it, in a vertical and clearly visible position, a warning flag.
16. RESIDENCE ON AIRPORT. No CONTRACTOR employee(s) will be permitted to reside at any location on the project site or airport property, including the Contractor's project trailer(s) or other temporary facilities.





**BID FORM**  
**SECTION C**



# **BID FORM**

---

**(Name of Bidder)**

**For**

**BUILDING 51 TENANT UPGRADES  
PROJECT**

**AT**

**ROANOKE REGIONAL AIRPORT  
ROANOKE, VIRGINIA**

**SUBMITTED TO THE**

**ROANOKE REGIONAL AIRPORT COMMISSION  
ROANOKE, VIRGINIA**

**BID NO. RRAC 20-004**

**THE BIDDER SHALL COMPLETE ALL ITEMS AND FILL IN ALL  
BLANKS IN THESE BID FORM PAGES**

**I. BID CONDITIONS AND PRICE:**

In compliance with the Invitation for Bids, the undersigned hereby proposes to furnish the materials and labor and to perform the work for the completion of the Building 51 Tenant Upgrades Project in strict accordance with the Invitation to Bid, Instructions to Bidders, the General Conditions, Technical Specifications, Drawings, Supplementary Drawings, and all other contract documents for the consideration of the price quoted in the following bid form, and agrees, upon receipt of written notice of award, that it will execute a contract in accordance with the bid as accepted and give the required contract bonds with good and sufficient surety, within fifteen (15) calendar days after receipt of notice of formal award of contract and presentation of the prescribed forms.

It is agreed that the undersigned has informed itself fully in regard to all conditions pertaining to the place where the work is to be done; that it has examined the drawings and specifications for the work and contractual documents thereto, including the special provisions, prior to the opening of bids, and that it has satisfied itself relative to the work to be performed.

It is agreed that the description of each item, being stated, implies although it does not mention, all incidentals and that the price stated is intended to cover all such work, materials, labor, equipment, and incidentals as constitute the bidder's obligations as

described in the specifications, and any details not specifically mentioned, but evidently included in the contract, shall be compensated for in the total lump sum price bid.

It is understood that this bid is submitted for the purpose of obtaining the work included in subject project at the Roanoke Regional Airport.

Said work is described in the project contract documents which also include the place, date, and time of opening bids.

Except to the extent extended by manufacturer's warranties required by the specifications and drawings, it is understood that all workmanship and materials under all items of work are guaranteed for two years from the date of final acceptance.

It is understood that the Owner reserves the right to accept or reject any or all bids and waive informalities.

It is understood that the quantities of work to be done are approximate only and are intended principally to serve as a guide in evaluation of bids, with the right reserved by the Owner to delete all or any portion of minor bid items.

The undersigned agrees that if awarded the contract, it will commence and complete the work in accordance with the provisions, requirements and deadlines of Section 2 of the General Conditions.

It is understood and agreed that for each calendar day that the work remains incomplete after the contract time and/or the milestone times (including all extensions and adjustments as provided in the Contract Documents), the amount per day as specified in Section 4, Contract Sum and Liquidated Damages of the form Contract (see Section D of these Specifications) shall be liquidated damages and may be retained, deducted and/or offset from any amounts due or to become due to the Contractor or its Surety. Such liquidated damages shall not be a penalty, but shall be considered as an agreed liquidation of a reasonable portion of damages that will be incurred by Owner as a result of the Contractor failing to complete the Work in the time provided in the Contract Documents. It is understood and agreed that: (a) the actual damages that may result from failure to complete the Work within the required time are uncertain and difficult to determine with exactness and that the fixed amount is not out of proportion to the probable loss; (b) Owner retains the right to make such retentions, deductions and/or offsets for liquidated damages at any time and that Owner's imposition and the retention, deduction and/or offset of any liquidated damages hereunder shall not be subject to any prior notice or claim requirements; and, (c) **by submitting this Bid, Contractor acknowledges and agrees that Contractor waives any defenses as to the validity of any liquidated damages provisions in this Contract based on such liquidated damages being void as penalties or not being reasonably related to actual damages.** It is further agreed, however, that application of liquidated damages hereunder shall not be Owner's exclusive remedy and shall not bar any other claim, cause of action, or remedy that Owner may have against Contractor under applicable law in the performance of this Contract.

It is understood that this project is funded by local and state government funds and the Contractor shall be subject to all laws and regulations applicable to recipients of such funds.

Enclosed is security as required, consisting of \_\_\_\_\_(cash, certified check, or bid bond) payable to the Roanoke Regional Airport Commission, in the amount of \$\_\_\_\_\_.

This amount equals five percent of the total amount bid submitted by the Contractor.

The Contractor shall be a licensed Class A Contractor registered with the Commonwealth of Virginia, shall list its registration number at the end of the bid in the designated location and shall enclose a copy of its licensing certificate.

This bid will remain valid and binding on Bidder for a period of forty five (45) days from date of bid opening.

**PART A.**

Lump sum price for demolition, renovation, and construction of the Building 51 Tenant Upgrade, complete and in accordance with the Plans and Specifications:

**PART A =** \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

**PART B.**

Unit Price No. 1: Asbestos Abatement: Provide all labor, equipment, materials, insurance, notifications, and permits necessary for the limited mastic demolition and removal within the renovation area and disposal of all asbestos-containing material prior to renovation activities as identified in the Scope of Work in accordance with applicable federal, state and local regulations and contract documents. Include cost of all labor, equipment, materials, transportation, and disposal of all waste materials generated during abatement activities. Pricing shall be complete and in accordance with the Plans and Specifications.

Estimated quantity of 16,645 SF @ \$\_\_\_\_\_ per SF = \$\_\_\_\_\_

**PART B =** \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

**PART C.**

Unit Price No. 1: Asbestos Abatement: Provide all labor, equipment, materials, insurance, notifications, and permits necessary for the limited floor tile demolition and removal within the renovation area and disposal of all asbestos-containing material prior to renovation activities as identified in the Scope of Work in accordance with applicable federal, state and local regulations and contract documents. Include cost of all labor, equipment, materials, transportation, and disposal of all waste materials generated during abatement activities. Pricing shall be complete and in accordance with the Plans and Specifications.

Estimated quantity of 15,358 SF @ \$\_\_\_\_\_ per SF = \$\_\_\_\_\_

**PART C =** \_\_\_\_\_ Dollars (\$\_\_\_\_\_).

**Total Contract Price Bid (PART A + PART B + PART C) for all work associated with the Building 51 Tenant Upgrades Project, and all associated services on the Project in accordance with Contract Documents:**

\_\_\_\_\_ (\$ \_\_\_\_\_)  
(use words) (dollar figures)

Contract Time: One hundred twenty (120) consecutive calendar days from effective date of Notice to Proceed.

For Liquidated Damages Contract Provision: See Section 4.B. of the Contract Form – Section D

**II. BIDDER CERTIFICATION OF LICENSURE AND LICENSURE OF SUBCONTRACTORS**

The undersigned Bidder hereby covenants and agrees to comply with Title 54.1, Chapter 11, Code of Virginia (1950), as amended, with respect to licensure of Bidder and all subcontractors who may be employed to perform the Work for the Roanoke Regional Airport Commission.

Bidder further represents and covenants: (i) that Bidder has verified that all subcontractors, currently identified in the Bid to perform a portion of the Work hold, or prior to performing any work at the airport, will hold required Commonwealth of Virginia and local licenses, including, without limitation, Contractor and business licenses; and, (ii) that if it is the Successful Bidder, Bidder shall verify that any additional subcontractors employed to perform the Work, subsequent to the date of this certification, shall hold all required Commonwealth of Virginia and local licenses, including, without limitation, Contractor and business licenses.

Bidder acknowledges and agrees that if it is awarded a contract for the Work, this Certification shall constitute a material part of Bidder's contract with the Commission and violation of the terms of this Certification shall constitute a breach of such Contract.

All persons signing this Bid, and thereby executing this Certification, on behalf of Bidder hereby warrant and represent that they have been duly authorized by proper action of Bidder to execute this Certification, and that upon such execution, this Certification shall be binding upon and enforceable against Bidder.

**III QUALIFICATION OF BIDDERS**

**Each bidder shall fully complete the information below, which may be used in determining Bidder's competency and responsibility in accordance with the General Conditions.**

FIRM: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

\_\_\_\_\_

PHONE: \_\_\_\_\_ FAX: \_\_\_\_\_

Contact in your firm for inquiries: \_\_\_\_\_

Years of business under present name: \_\_\_\_\_

Date of Incorporation: \_\_\_\_\_

Place of Incorporation: \_\_\_\_\_

Contracting Specialties: \_\_\_\_\_

Years performing work specialties: \_\_\_\_\_

Maximum Bonding Limits of firm: \_\_\_\_\_

List equipment available for project: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Name of proposed on-site Superintendent and relevant project experience during last five (5) years: \_\_\_\_\_

(Complete next page for relevant project experience of proposed on-site project superintendent)

### Relevant Project Experience for Proposed Superintendent

<u>Type of Project and Date</u>	<u>Responsibilities</u>	<u>Contact Name/Phone</u>
---------------------------------	-------------------------	---------------------------

No.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

---



---



---



---



---



---

**Bidder acknowledges and agrees that the Commission retains the absolute right to reject the above designated individual as the project superintendent for this work if it determines that the persons job experience and/or references are not adequate or good, and to require bidder to provide one or more alternative proposed superintendents, along with their relevant job experience and references, until the parties are in agreement as to the superintendent for the job.**

Has Firm:

Failed to complete a contract? \_\_\_\_\_

Been involved in a bankruptcy or reorganization? \_\_\_\_\_

Pending judgment claims or suits against Firm? \_\_\_\_\_

(If answer is "yes" to any of the preceding, submit details on separate sheet).

Contractor and all proposed subcontractors are prequalified by VDOT to perform the work required by this contract Yes \_\_\_\_ No \_\_\_\_

List three (3) most recent contracts or subcontracts completed in the last five (5) years which included work similar to that required in this project.

<u>Type of Project</u>	<u>Contract With Contact Person/ Phone No.</u>	<u>Contract Amount</u>	<u>Date Completed</u>



---

List of key subcontractors to be utilized on this project and their responsibilities:

---

---

---

#### **IV. CERTIFICATION OF NON-COLLUSION**

The undersigned bidder hereby certifies that the accompanying bid is not the result of or affected by, any act of collusion with another person or company engaged in the same line of business or commerce, or any act of fraud punishable under Title 18.2, Chapter 12, Article 1.1 of the Code of Virginia, 1950, as amended. Furthermore, I understand that fraudulent and collusive bidding is a crime under the Virginia Governmental Frauds Act, the Virginia Government Bid Rigging Act, the Virginia Antitrust Act, and Federal Law and can result in fines, prison sentences, and civil damage awards.

The undersigned bidder agrees to abide by all conditions of this bid and the person signing this bid on behalf of bidder hereby certifies that (s)he is authorized to sign this bid for the bidder.

#### **V. COMMONWEALTH OF VIRGINIA WORKERS' COMPENSATION CERTIFICATE OF COVERAGE (Revised 04/05/12)**

Section 2.2-4332, Code of Virginia, requires construction contractors and subcontractors to obtain and maintain workers' compensation insurance for the duration of the Work on behalf of the Commonwealth of Virginia, its departments, institutions or agencies, or local governmental entities.

Satisfactory evidence of coverage on this form must be provided to the Commission prior to commencement of work.

The undersigned organization stipulates that it:

- A. Has workers' compensation insurance and is in compliance with the Workers' Compensation statues of the Commonwealth of Virginia \_\_\_ Yes \_\_\_ No

Insurance Company \_\_\_\_\_

Policy expiration date \_\_\_\_\_, or

- B. Is self insured for workers' compensation \_\_\_\_\_ Yes.

## VI. COMPLIANCE WITH STATE LAW; FOREIGN AND DOMESTIC BUSINESSES AUTHORIZED TO TRANSACT BUSINESS IN THE COMMONWEALTH

Pursuant to Virginia Code Section 2.2-4311.2 (effective July 1, 2010), each bidder or offeror organized or authorized to transact business in the Commonwealth of Virginia pursuant to Title 13.1 or Title 50 of the Code of Virginia, (1950), as amended, or as otherwise required by law, is required to include in its bid or proposal its Virginia State Corporation Commission (SCC) Identification Number. Any bidder or offeror that is not required to be authorized to transact business in the Commonwealth of Virginia as a domestic or foreign business entity under title Title 13.1 or Title 50 or as otherwise required by law is required to include in its bid or proposal a statement describing why the bidder or offeror is not required to be so authorized.

Please complete the following:

A. \_\_\_\_\_ Bidder/Offeror is a Virginia business entity organized and authorized to transact business in Virginia and such bidder's/offeror's SCC Identification Number is:

\_\_\_\_\_.

B. \_\_\_\_\_ Bidder/Offeror is an out-of-state (foreign) business entity authorized to transact business in Virginia and such bidder's/offeror's SCC Identification Number is:

\_\_\_\_\_.

C. \_\_\_\_\_ Bidder/Offeror does not have an Identification Number issued to it by the SCC and such bidder/offeror is not required to be authorized to transact business in Virginia by the SCC for the following reason(s):

\_\_\_\_\_.

\_\_\_\_\_.

Please attach additional sheets of paper if more space is needed to explain why such bidder/offeror is not required to be authorized to transact business in Virginia.

The undersigned hereby acknowledges the receipt of the following Addenda to the Contract Documents.

Addendum No. One Issued \_\_\_\_\_(DATE)

Addendum No. Two Issued \_\_\_\_\_(DATE)

Addendum No. Three Issued \_\_\_\_\_(DATE)

Addendum No. Four Issued \_\_\_\_\_(DATE)

Addendum No. Five Issued \_\_\_\_\_(DATE)

**EACH BIDDER MUST COMPLETE AND SIGN THE INFORMATION BLOCK BELOW OR ELSE ITS BID SHALL BE DETERMINED TO BE NON-RESPONSIVE.**

\_\_\_\_\_  
Complete Firm Name of Bidder

\_\_\_\_\_  
Signature of Authorized Official

\_\_\_\_\_  
Name & Title of Signing Official

Business Address:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone:

(     )

Area Code

Telefax:

(     )

Area Code

CONTRACTOR'S VIRGINIA "CLASS A" CONTRACTOR NO: \_\_\_\_\_

**\*\* END OF BID \*\***

Form 100 – Bid Bond for Construction Project

(Revised 120112)

**ROANOKE REGIONAL AIRPORT COMMISSION  
BID BOND FOR CONSTRUCTION PROJECT**

KNOW ALL MEN BY THESE PRESENTS: that

\_\_\_\_\_  
Insert full name or legal title and address of Principal)

as Principal (hereinafter referred to as "Contractor"), and

\_\_\_\_\_  
(Insert full name or legal title and address of Surety),

as Surety (hereinafter referred to as "Surety"),

a corporation duly organized under the laws of the State of \_\_\_\_\_ and legally authorized to do business in the Commonwealth of Virginia, are held and firmly bound unto the ROANOKE REGIONAL AIRPORT COMMISSION, 5202 Aviation Drive, Roanoke, Virginia 24012, as obligee (hereinafter referred to as "Commission"), in the amount of \_\_\_\_\_ DOLLARS (\$ 00.00), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

WHEREAS, Contractor has submitted to Commission a certain bid dated \_\_\_\_\_ (Bid. No.20-004), to enter into a contract ("Contract") for the following construction project: Building 51 Tenant Upgrades Project at the Roanoke Regional Airport ("Bid"), including, without limitation and as may be applicable, the Invitation To Bid, Instructions to Bidders, General Conditions, completed Bid Forms, Specifications, Plans and Drawings, if any, which documents are referred to collectively as "Bid Documents" and are expressly incorporated herein by reference and made a part of this bond.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION are as follows:

- a. If the Contractor's Bid shall be rejected, or if said Bid shall be accepted and the Contractor shall timely deliver to Commission the Contract and all required documentation fully completed and properly executed in the form required in the Bid and Contract Documents, including all documents necessary to form a valid and binding contract, as determined by Commission, and, if Contractor shall in all other respects perform the obligations created by the acceptance of said Bid, then this obligation shall be null and void, otherwise this obligation and all provisions of this bond shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penalty amount of this bond.
- b. If Contractor's bid shall be accepted but Contractor shall fail to timely deliver to Commission all required documentation fully completed and properly executed in the form and as required in the Bid and Contract documents, or in any other respect fail to perform the obligations created by the acceptance of said Bid, as determined by Commission, Contractor and Surety shall defend, indemnify, and hold Commission harmless from and against any and all liability, loss, cost, damage, or expense, including reasonable attorney's fees and/or the cost of any other professional services, which Commission may incur or which may result from or be imposed upon Commission by reason of such failure.
- c. The Surety, for value received, hereby stipulates and agrees that the obligations of the Surety and this bond shall be in no way impaired or affected by any extension by Commission of the time within which Commission may accept such Bid, and the Surety does hereby expressly waive any notice of any such extension.

- d. The provisions of this bond shall be governed by and are intended to be consistent with the laws of the Commonwealth of Virginia. In light of this express choice of law provision, Virginia law for determining governing law shall not apply to the provisions of this bond. Contractor, for itself and its successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of Commission to require a bond containing the provisions contained herein and they hereby further expressly waive any defense which they or either of them might interpose to any action brought hereon upon the ground that there is no law authorizing the Commission to require the provisions herein.
- e. This bond shall continue in full force and effect and shall not be deemed canceled or to have expired unless and until written notice of cancellation or expiration from Surety is received by Commission at least 90 calendar days prior to the effective date of such cancellation or expiration.
- f. Wherever possible, each provision of this bond shall be interpreted in such manner as to be effective and valid under applicable law. If any provision of this bond is held illegal or unenforceable in a judicial proceeding, such provision shall be severed and shall be inoperative, and all remaining provisions of this bond shall remain operative and binding on the parties.
- g. Any suit or action hereunder shall be brought in a Virginia court of competent jurisdiction in and for the City of Roanoke, or in the United States District Court for the Western District of Virginia, Roanoke Division, and not elsewhere.
- h. This bond shall be construed and interpreted without regard to the identity of the party which drafted its various provisions. Every provision of this bond shall be construed as if all parties participated equally in the drafting of that provision. Any legal principle or rule of construction that a document is to be construed or interpreted against the drafting party shall not be applicable in any legal or other proceeding involving the provisions of this bond, and such principle or rule is expressly waived by the parties to this bond.
- i. Each party to this bond represents and covenants that the individual executing this bond on its behalf has full, unconditional authority to execute this bond and that, upon the signing of the bond by the authorized individual for each party, this bond shall become binding upon all parties

SIGNED and SEALED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, in the presence of:

\_\_\_\_\_  
Contractor

WITNESS:

\_\_\_\_\_

By: \_\_\_\_\_ (Seal)

\_\_\_\_\_  
(Type Name and Title)

\_\_\_\_\_  
Surety

WITNESS:

\_\_\_\_\_

By: \_\_\_\_\_ (Seal)

\_\_\_\_\_  
Attorney-In-Fact

\_\_\_\_\_  
(Type Name and Title)

(SURETY: Affix seal and attach current power of attorney)

**CONTRACT FORMS**

**SECTION D**





**CONTRACT  
FOR  
BUILDING 51 TENANT UPGRADES PROJECT  
AT THE ROANOKE REGIONAL AIRPORT**

THIS CONTRACT, is made and entered into this \_\_\_\_ day of \_\_\_\_\_, 2020, between the Roanoke Regional Airport Commission, a body corporate, (hereinafter referred to as "Commission" or "Owner") and \_\_\_\_\_, (hereinafter referred to as "Contractor"), pursuant to Resolution No. \_\_\_\_\_ adopted by the Commission on \_\_\_\_\_, 2020, whereby for good and valuable consideration, including the promises set forth herein, the parties agree as follows:

1. **WORK**

Contractor hereby agrees to provide all labor, equipment, materials, services, incidentals and warranties necessary to complete the \_\_\_\_\_ Project ("the Work") at the Roanoke Regional Airport.

A more detailed description of the Work and its requirements is contained in other sections of the Contract Documents.

2. **CONTRACT DOCUMENTS**

This Contract shall consist of the following Contract Documents: this executed Contract form; the Invitation to Bid; the Instructions to Bidders; General Conditions; the Technical Specifications; Drawings; Supplementary Drawings; Appendices; Addenda; and Contractor's completed Bid Forms, which are attached hereto and incorporated herein by reference. In the event of any conflict or inconsistency between this executed Contract Form and the Contractor's completed Bid Form, the terms and conditions of this Contract shall control and prevail. Contractor has entered into Performance and Labor and Material Payment Bonds, with surety, each in the penal sum of One Hundred Percent (100%) of the Contract Sum, payable to the Roanoke Regional Airport Commission, conditioned upon the faithful performance and upon the payment for labor and material, respectively, pursuant to this Contract and the Contract Documents hereinafter set out, upon which the bid of said Contractor was offered.

3. **TERM (CONTRACT TIME)**

Contractor agrees that time is of the essence for completion of this Contract. All preliminary and administrative work shall be completed within one hundred twenty (120) consecutive calendar days after the effective date of the written Notice to Proceed.

All Work required to complete the Building 51 Tenant Upgrade and all associated services, final clean-up, and final acceptance issued. Contractor shall notify the

Owner in writing received at least 48 hours in advance of the date it desires to begin the Work at the site. The work, once begun in any area, must continue uninterrupted until completion.

4. **CONTRACT SUM AND LIQUIDATED DAMAGES**

- A. Owner agrees to pay Contractor the Contract Price sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_.00) upon satisfactory completion of the Work as provided for in this Contract and as solely determined by Commission. Contractor acknowledges and agrees that the Contract payment amount may be increased or decreased by additions to and/or reductions in the Work only as effected by prior written change orders or amendments signed by both parties. Contractor agrees not to initiate any additional work, not called for in the Contract Documents, for which Contractor intends to seek additional compensation without first notifying Engineer in writing and obtaining Owner's prior approval by properly executed written change order or Contract Amendment unless pursuant to a Construction Change Directive.

The Contract sum specified above shall be the full and only sum paid to Contractor for all Work, materials, expenses and costs specified herein or incidental thereto.

- B. It is understood that for each calendar day that the work remains incomplete after the contract, including all extensions and adjustments as provided by written Change Order, the sum of One Hundred Dollars (\$100.00) per day may be claimed as liquidated damages and retained, offset or deducted from any money due or to become due to the Contractor or its Surety. Such deducted sums may be assessed cumulatively, and such deducted sums shall not be considered to be a penalty but shall be considered as liquidation of a reasonable portion of damages that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in its contract. It is understood and agreed that: (a) the actual damages that may result from failure to complete the work within the required time are uncertain and difficult to determine with exactness and that the fixed amount is not out of proportion to the probable loss; (b) Owner retains the right to make such retentions, deductions and/or offsets for liquidated damages at any time and that Owner's imposition and the retention, deduction and/or offset of any liquidated damages hereunder shall not be subject to any prior notice or claim requirements; and, (c) Contractor waives any defenses as to the validity of any liquidated damages provisions in this Contract based on such liquidated damages being void as penalties or not being reasonably related to actual damages. It is further agreed, however, that application of liquidated damages hereunder shall not be Owner's exclusive remedy and shall not bar

any other claim, cause of action, or remedy that Owner may have against Contractor under applicable law in the performance of this Contract.

Reference is made to Subsection 41 DETERMINATION AND EXTENSION OF CONTRACT TIME of the General Conditions.

5. **PAYMENTS**

- A. Payment shall be made subject to and in accordance with Contractor's bid and the requirements of the Contract Documents.
- B. Contractor shall pay all applicable taxes, including sales tax on materials supplied.
- C. Contractor agrees that the Owner may withhold, deduct, or offset payment to Contractor under the Contract when the Owner's property is damaged or destroyed by poor performance or defective equipment or materials employed by Contractor, for the payment of fines or penalties by Owner as a result of Contractor's actions or failure to act, or for unsatisfactory performance under this Contract as determined by Engineer. Contractor also agrees that it shall be liable to the Owner for actual damages for replacement or repair of property, materials, or services caused by this damage or destruction to the Owner's property, or for unsatisfactory performance.

6. **COMPLIANCE WITH LAWS AND LICENSING REQUIREMENTS**

Contractor confirms that it and all of its subcontractors have all licenses and permits necessary to perform the Work and that they shall maintain all such licenses and permits as may be required by Federal, State, and local agencies during the term of this Contract.

The Contractor shall be solely responsible for paying all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work. The Contractor shall be responsible for arranging all inspections by local authorities for compliance with all building code requirements, ordinances and regulations.

No unnecessary delay shall be permissible in the completion of the Work due to the failure or delay in obtaining permits required for the Work.

Contractor expressly warrants that in the performance of the Work it shall comply with all applicable laws, codes, regulations, standards, etc., which may be required of it by all applicable local, state and federal jurisdictions and their respective agencies, offices, bureaus, and other administrative/regulatory entities, including, but not limited to, all local, state and federal ordinances, laws and regulations, concerning building and fire codes, solid waste and environmental matters, FAA,

TSA and airport security regulations, and all applicable sections of the Occupational Safety and Health Act (OSHA), the Virginia Uniform Statewide Building Code.

7. **INDEMNIFICATION**

Contractor shall defend, indemnify and hold harmless Commission and its officials, officers, board members, agents, and employees, against any and all loss, cost, or expense, including reasonable attorney's fees, resulting from any claim, whether or not reduced to judgment, and for any liability of any nature whatsoever, that may arise out of or result from the Work or its performance by Contractor or its sub-contractor or the violation of any of the terms and conditions of this Contract, including, without limitation, fines and penalties, violations of federal, state or local laws or regulations promulgated thereunder, personal injury, wrongful death or property damage claims, Contractor's breach of airport security or failure to comply with security regulations as required herein. Should Contractor inadequately remedy or fail to remedy a violation of this agreement after notification by Commission, Commission shall be authorized to take whatever corrective action Commission deems necessary to eliminate the violation, at the sole expense of Contractor.

8. **INSURANCE**

A. **Liability Coverage**

Prior to execution of this Contract by Commission, Contractor shall provide Owner's Executive Director suitable evidence of commercial general liability occurrence-type insurance that includes contractual liability and products and completed operations insurance, and automobile liability with "any auto" coverage, naming Contractor as insured and its employees, subcontractors, the Commission and its officials, officers, board members, agents, employees, and volunteers as additional insureds, providing coverage against any and all claims and demands made by any person or persons or any other entity whomsoever for injuries or death or property damage incurred in connection with or arising out of the Work, services, items and/or other matters to be performed hereunder and including contractual liability coverage for the terms and conditions of this contract, which policies shall provide limits of not less than **\$5,000,000.00**.

B. **Workers Compensation**

Prior to execution of this Contract by Commission, the Contractor shall obtain and provide evidence of statutory Worker's Compensation and Employer's Liability Insurance for all of its employees engaged in the Work, and maintain such coverage during the term of the Contract. In case any such work is

subcontracted, the Contractor shall require the Subcontractor to provide such insurance for all of its employees engaged in the Work.

B. Notice to Commission

Contractor shall immediately notify the Commission in writing of any changes, modifications, expiration and/or termination of any insurance coverages and/or policies required by this Contract.

C. Umbrella Policy

The required limits of insurance for this Contract may be achieved by combining underlying primary coverage with an umbrella liability coverage to apply in excess of the general and automobile liability policies, provided that such umbrella liability policy follows the form of the underlying primary coverage.

D. Insurance Company

Insurance coverage shall be in a form and with an insurance company approved by the Commission, which approval shall not be unreasonably withheld. Any insurance company providing coverage under this contract shall be authorized to do business in the Commonwealth of Virginia.

E. No Exclusions

The contractor's insurance policies and/or coverages shall not contain any exclusions for the Contractor's subcontractors.

F. Maintenance of Insurance

The continued maintenance of the insurance policies and coverages required by this Contract during the time that the Contractor is working for the Commission is a continuing obligation, and the lapse and/or termination of any such policies or coverages without approved replacement policies and/or coverages being obtained shall be grounds for termination of the Contractor for default.

G. Insurance Not To Be Limit On Liability

Nothing contained in the insurance requirements is to be construed as limiting the liability of the Contractor, and/or its subcontractors, or their insurance carriers may have under this Contract, including without limitation the indemnification provision contained herein. The Commission does not in any way represent that the coverages or limits of insurance specified are sufficient or adequate to protect the Contractor's interest or liabilities, but are merely minimums. The obligation of the contractor, and its subcontractors, to purchase insurance shall not in any way limit the obligations of the Contractor in the event that the Commission or any of those named above should suffer any injury or loss in excess of the amount actually recoverable through insurance. Furthermore, there is no requirement or obligation for the

Commission to seek any recovery against the Contractor's insurance company before seeking recovery directly from the Contractor.

9. **CANCELLATION**

A. **For Cause**

The Owner's Executive Director may cancel the Contract upon written notice received by Contractor whenever Contractor's services fall below the quality of services generally provided by others for similar types of services, or Contractor has failed to perform in accordance with this Contract. Prior to any such cancellation, Contractor shall be given written notice and ten (10) calendar days to cure such failures. However, in the event that that Contractor's failure is a violation of law, and/or an act or condition that poses a risk of harm to people or their property, then Contractor shall immediately take action to cure such failure and shall complete such cure within 24 hours. Default by Contractor hereunder shall constitute a basis for determining for future contracts that Contractor is not a responsible bidder and for Commission to refuse to award such future contracts to Contractor.

In the event that Contractor defaults in the performance of any of the terms, conditions or agreements contained in this Contract, and Owner places the enforcement of all or part of this Contract in the hands of an attorney for enforcement, including the filing of a suit upon the same, Contractor agrees to pay all of Owner's reasonable attorney's fees and costs related to any such proceeding.

B. **Without Cause**

The Executive Director of the Commission may cancel the contract without cause at any time upon ten (10) days advance written notice, and may stop the work at any time during the ten day period, provided that Contractor shall be paid for all work satisfactorily completed, as determined by Commission in its sole and exclusive discretion, on or before the effective date of the cancellation or stop work order, whichever is sooner.

10. **ENTIRE AGREEMENT**

This Contract embodies the entire understanding between the parties. There are no oral agreements or representations in connection herewith.

11. **SPECIAL CONTRACT TERMS**

A. **Performance and Warranty**

1. The Work shall be performed in a good, workmanlike and safe manner, consistent with industry standards and any applicable manufacturer's or vendor's warranty or product manufacturer's recommended guidelines.
2. Contractor shall protect the property of the Owner and tenants from any and all damage caused by the Contractor's operations.
3. Contractor shall maintain the work area in a neat, clean and safe condition at all times. Recognizing the Foreign Object Debris (FOD) could severely damage aircraft and jeopardize the lives of passengers, Contractor shall vigilantly comply with the requirements in the Contract Documents related to the clean up and removal of demolition/removal debris and waste materials.
4. Specific Warranty requirements for this Contract are contained in Section 33 of the General Conditions for the Contractor and in pertinent sections of the Technical Specifications, both of which are incorporated herein by reference. Nothing contained in this paragraph will be construed to establish a period of limitations with respect to any liability Contractor may have for breach of this Contract.

B. **Inspection**

A representative of the Owner shall have the right at all times to examine the supplies, materials and equipment used by Contractor, to observe the operations of the Contractor and its employees, to verify the Work being performed, and to do any act or thing which the Owner may be obligated or have the right to do under this contract.

C. **Scheduling and Notification of Work**

1. Prior to Contractor beginning any work at the airport, it shall participate in the pre-construction meeting which shall include representatives of the Commission and the Consultant and shall address many of the issues identified in Item 3. below. Such meeting should take place at least two weeks prior to the beginning of the Work.
2. The Work shall be scheduled at least 48 hours in advance with the Commission's Project Coordinator. Unless other arrangements have been made, any employee or representative of Contractor, prior to

performing any work on Commission premises and before leaving Commission premises, shall notify Commission's designated representative who may desire to undertake a walk through inspection prior to Contractor's leaving the premises.

3. Issues of parking, access, dumpsters, storage of equipment and supplies, use of sanitary facilities, schedules for security badging and training and other related procedures shall be governed generally by the contract documents, however, specific issues or problems will be coordinated by Contractor with the Commission's Project Coordinator in order to minimize inconvenience to Contractor, airport businesses and the general public.
4. The Contractor shall schedule the work to suit the Owner's requirements.
5. Existing buildings will be occupied by the Owner and/or its tenants, and in full operation during construction. If at any time Contractor's activities create such noise, dust, fumes or noxious odors so as to substantially curtail or affect the operations of Owner, its tenants or passengers, then Contractor may be required to cease its operations until the affected activities cease for that work period or for the day.
6. Work necessary to be performed in, or otherwise affecting the use or comfort of, the existing buildings shall be coordinated with the occupants' schedules.
7. Under no circumstances shall any emergency or required means of ingress or egress be blocked, during hours the public is expected to be in the terminal.

12. **DETAILED DESCRIPTION AND REQUIREMENTS OF THE WORK**

The specific details of the Work are contained in the Drawings and Technical Specifications which are incorporated herein by reference.

13. **NON-DISCRIMINATION**

A. During the performance of this contract, the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin, except where religion, sex or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of the Contractor.

The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.



2. The Contractor, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, will state that such Contractor is an equal opportunity employer.
  3. Notices, advertisements and solicitations places in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.
- B. The Contractor will include the provisions of the foregoing paragraphs 1. 2. and 3. in every subcontract or purchase order of over \$10,000, so that the provisions will be binding upon each subcontractor or vendor.
- C. The Roanoke Regional Airport Commission does not discriminate against faith based organizations.

14. **IMMIGRATION REFORM AND CONTROL ACT OF 1986**

The Contractor does not, and shall not during the performance of the Contract for goods and services in the Commonwealth knowingly employ an unauthorized alien as defined in the Federal Immigration Reform and Control Act of 1986.

15. The new regulations require that the EEO clause be made part of the Contract by Citation 41CFR 60-300.5(a) and 41CFR 60-741(a).

**“This Contractor and subcontractor shall abide by the requirements of 41CFR 60-300.5(a) and 41CFR 60-741(a). These regulations prohibit discrimination against qualified individuals and protected veterans on the basis of disability or veteran status and requires affirmative action by covered prime Contractors and subcontractors to employ and advance in employment qualified individuals with disabilities and protected veterans.”**

16. **GENERAL CIVIL RIGHTS PROVISIONS**

Title VI Solicitation Notice:

The Commission, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. 2000d-2000d4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any Contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award.

The contractor agrees that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the

grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance.

Title VI Clauses for Compliance with Nondiscrimination Requirements  
(Source: Appendix A of Appendix 4 of FAA Order 1400.11, Nondiscrimination in Federally-Assisted Programs at the Federal Aviation Administration)

### Compliance with Nondiscrimination Requirements

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Statutes and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:
  - a. Withholding payments to the contractor under the contract until the contractor complies; and/or
  - b. Cancelling, terminating, or suspending a contract, in whole or in part.
6. Incorporation of Provisions: The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

#### Title VI List of Pertinent Nondiscrimination Authorities

(Source: Appendix E of Appendix 4 of FAA Order 1400.11, Nondiscrimination in Federally-Assisted Programs at the Federal Aviation Administration)

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);

- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 *et seq.*).

17. **FEDERAL FAIR LABOR STANDARDS ACT**

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR Part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping and child labor standards for full and part time workers.

The [contractor | consultant] has full responsibility to monitor compliance to the referenced statute or regulation. The [contractor | consultant] must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor-Wage and Hour Division.

18. **OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970**

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20CFR Part 1910). Contractor may address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor-Occupational Safety and Health Administration.

19. **DRUG FREE WORKPLACE**

During the performance of this Contract, the Contractor agrees to (i) provide a drug-free workplace for the Contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in the contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of the Contractor that the Contractor maintains a drug-free workplace; and, (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over \$10,000.00 so that the provisions will be binding upon each such subcontractor or vendor. For purposes of this section, "drug-free workplace" means a site for the performance of work done in connection with a specific contract awarded to a contractor in accordance with the Roanoke Regional Airport Commission's Procurement Regulations and applicable Virginia procurement laws, the employees of whom are prohibited from engaging in the unlawful manufacture, sale, distribution, dispensation, possession or use of any controlled substance or marijuana during the performance of the contract.

20. **EVIDENCE OF AUTHORITY TO TRANSACT BUSINESS IN VIRGINIA**

Pursuant to 2.2-4311.2 (A) of the Code of Virginia (1950), as amended, if the Contractor is organized as a stock or non-stock corporation, limited liability company, business trust, or limited partnership or registered as a registered limited liability partnership, the Contractor shall provide documentation acceptable to Commission establishing that the contractor is authorized to transact business in the Commonwealth as a domestic or foreign business entity if so required by Title 13.1 or Title 50 of the Code of Virginia (1950), as amended, or as otherwise required by law. The Contractor shall not allow its existence or its certificate of authority or registration to transact business in the Commonwealth to lapse, if so required under Title 13.1 or Title 50, or to be revoked or cancelled at any time during the term of the contract. The Commission may void this contract if the Contractor fails to remain in compliance with the provisions of this section.

21. **GOVERNING LAW AND VENUE**

The provisions of this Contract shall be governed by and are intended to be consistent with the laws of the Commonwealth of Virginia. In light of this express choice of law provision, Virginia law for determining governing law shall not apply to the provisions of this Contract. Every action brought under or related to this Contract shall be brought in a Virginia court of competent jurisdiction in the City of Roanoke, or in the United States District Court for the Western District of Virginia, Roanoke, Virginia, and not elsewhere.

22. **SEVERABILITY**

Wherever possible, each provision of this Contract shall be interpreted in such manner as to be effective and valid under applicable law. If any provision of this Contract is held illegal or unenforceable in a judicial proceeding, such provision shall be severed and shall be inoperative, and all remaining provisions of this Contract shall remain operative and binding on the parties. This Contract shall be construed and interpreted without regard to the identity of the party which drafted its various provisions. Every provision of this Contract shall be construed as if all parties participated equally in the drafting of that provision. Any legal principle or rule of construction that a document is to be construed or interpreted against the drafting party shall not be applicable in any legal or other proceeding involving the provisions of this Contract, and such principle or rule is expressly waived by the parties to this Contract.

23. **SURVIVAL**

All representations, agreements, covenants, and indemnifications made in or given by Contractor in this Contract shall survive the completion of all services under this Contract and the termination of this Contract for any reason.

24. **DUPLICATE COPIES**

This Contract may be executed in any number of counterparts, each of which shall be deemed an original, and all of such counterparts together shall constitute one and the same instrument.

25. **CERTIFICATION**

The undersigned individual executing this Contract on behalf of Contractor certifies and warrants that he or she is authorized to enter into this Contract and bind Contractor to all of the terms and conditions contained herein.

26. **HEADINGS**

The headings used in this Contract are intended for convenience of reference only and do not define, expand, or limit the scope or meaning of any provision of this Contract.

27. **NOTICES**

A. Forms of Notice. Unless otherwise specified, all notices, consents and approvals required or authorized by this Contract to be given by or on behalf of either party to the other, shall be in writing and signed by a duly designated representative of the party by or on whose behalf they are given, and shall be deemed given three days after the time a certified letter, properly addressed, postage prepaid, is deposited in any United States Post Office, or upon delivery by hand, or upon delivery by overnight express carrier.

B. Notice to Commission. Notice to Commission shall be addressed to it and delivered at the office of the Executive Director, Roanoke Regional Airport Commission, 5202 Aviation Drive, Roanoke, Virginia 24012, or at such other office as Commission may hereafter designate by notice to contractor in writing.

C. Notice to Contractor. Notice to Permittee shall be addressed and delivered to

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_, or at such other office in the continental United States as Contractor may hereafter designate by notice to Commission in writing.

END OF CONTRACT PROVISIONS

WITNESS the following signatures:

Contractor: (To be completed after bid is awarded)

By: (Not for signature)  
Title: N/A  
Date: N/A

Attest: N/A  
Title: \_\_\_\_\_

Roanoke Regional Airport Commission

By: N/A  
Title: Executive Director  
Date: \_\_\_\_\_

Attest: N/A  
Title: Commission Secretary

Certification of funding

By: \_\_\_\_\_  
Treasurer  
Roanoke Regional Airport  
Commission  
\_\_\_\_\_  
Account Number

Approved for legal form

By: \_\_\_\_\_  
General Counsel  
Roanoke Regional Airport  
Commission

**\*\* END OF CONTRACT \*\***



ROANOKE REGIONAL AIRPORT COMMISSION

PERFORMANCE BOND FOR CONSTRUCTION PROJECT

KNOW ALL MEN BY THESE PRESENTS: that

---

(Insert full name or legal title and address of Contractor)

as Principal (hereinafter referred to as “Contractor”), and

---

(Insert full name or legal title and address of Surety)

as Surety (hereinafter referred to as “Surety”)

a corporation duly organized under the laws of the State of \_\_\_\_\_ and legally authorized to do business in the Commonwealth of Virginia, are held and firmly bound unto the ROANOKE REGIONAL AIRPORT COMMISSION, 5202 Aviation Drive, Roanoke, Virginia 24012, as Obligee (hereinafter referred to as “Commission”), in the amount of

\_\_\_\_\_ DOLLARS (\$ \_\_\_\_\_),  
(Insert full dollar value of construction contract)

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

WHEREAS, Contractor has entered into a contract with Commission, dated \_\_\_\_\_, as the successful bidder for the Building 51 Tenant Upgrades Project (“Project”) at the Roanoke Regional Airport, Bid No. 20-004 in accordance with all contract documents for such Project, including, without limitation and as may be applicable, the Invitation to Bid, Instructions to Bidders, General Conditions, completed Bid Forms, Specifications, Plans and Drawings, if any, and the completed contract form, as well as all other covenants, agreements, and obligations to be performed or paid by Contractor, which documents are referred to collectively as the “Contract” and are expressly incorporated herein by reference and made a part of this bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if the Contractor shall promptly, faithfully, and fully perform the terms, conditions, and provisions of the Contract, in strict conformity with each and every requirement thereof, as determined by Commission, then this obligation shall be null and void; otherwise this obligation and provisions of this bond shall remain in full force and effect as stated herein.

- a. If the Contractor shall default, breach, or fail to promptly, faithfully, and fully perform any of the terms, conditions or provisions of the Contract, in strict conformity with each and every requirement thereof, as determined by Commission, Surety shall complete or provide for the completion of the Contract, subject to the approval of the Commission, in accordance with its terms and conditions, and Surety hereby agrees to defend, indemnify, and hold Commission harmless from and against any and all liability, loss, cost, damage or expense, including reasonable attorney's fees and/or the cost of any other professional services which Commission may incur or which may result from or be imposed upon Commission by reason of any default, breach, or failure of Contractor and/or its agents, servants, subcontractors or employees to so perform the Contract, and Surety shall pay and/or repay and reimburse the Commission promptly upon demand for any and all sums due to, paid out, or expended by or on behalf of Commission on account of or resulting from such default, breach, or failure to so perform any of the terms or conditions of the Contract within the time and in the manner therein provided, including, without limitation, any maintenance, warranty, or guarantee obligations in the Contract.
- b. Any alteration, amendment, modification, omission, addition, extension, or forbearance which may be made in or to the terms of the Contract, including, without limitation, the amount to be paid or the obligations to be performed under it, or the giving by the Commission of any extension of time for the performance of the Contract or any other forbearance of any nature whatsoever on the part of either the Commission or the Contractor to the other shall not in any way affect or release the Contractor and the Surety, or either of them, their heirs, executors, administrators, successors or assigns with regard to their obligations and liability hereunder. Notice of any such alteration, amendment, modification, omission, addition, extension, or forbearance is hereby expressly waived by Surety. Any delay, omission, or failure by Commission to call upon the Surety in any instance shall not release the Surety from any obligation hereunder.
- c. This Performance Bond shall be valid and continue in full force and effect and shall not be canceled or expire or be deemed to be canceled or have expired until all of Contractor's obligations under the Contract have been promptly, faithfully, and fully completed, as determined by Commission, including, without limitation, any maintenance, warranty, and guarantee obligations, as determined by Commission.
- d. The obligations evidenced herein shall constitute the joint and several obligations of the Contractor, the Surety, and their respective heirs, executors, administrators, successors and assigns.
- e. Any suit or action hereunder shall be brought in a Virginia court of competent jurisdiction in and for the City of Roanoke, Virginia, or in the United States District Court for the Western District of Virginia, Roanoke Division, and not elsewhere.

- f. The provisions of this bond shall be governed by and are intended to be consistent with the laws of the Commonwealth of Virginia. In light of this express choice of law provision, Virginia law for determining governing law shall not apply to the provisions of this bond. The Contractor, for itself and its successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the Commission to require a bond containing the provisions contained herein, and they do hereby further expressly waive any defense which they or either of them might interpose to any action brought hereon upon the ground that there is no law authorizing the Commission to require the provisions herein.
- g. Wherever possible, each provision of this bond shall be interpreted in such manner as to be effective and valid under applicable law. If any provision of this bond is held illegal or unenforceable in a judicial proceeding, such provision shall be severed and shall be inoperative, and all remaining provisions of this bond shall remain operative and binding on the parties.
- h. This bond shall be construed and interpreted without regard to the identity of the party which drafted its various provisions. Every provision of this bond shall be construed as if all parties participated equally in the drafting of that provision. Any legal principle or rule of construction that a document is to be construed or interpreted against the drafting party shall not be applicable in any legal or other proceeding involving the provisions of this bond, and such principle or rule is expressly waived by the parties to this bond.
- i. Each party to this bond represents and covenants that the individual executing this bond on its behalf has full, unconditional authority to execute this bond and that, upon the signing of the bond by the authorized individual for each party, this bond shall become binding upon all parties

SIGNED and SEALED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, in the presence of:

\_\_\_\_\_  
Contractor

WITNESS:

By: \_\_\_\_\_ (Seal)

\_\_\_\_\_

\_\_\_\_\_  
(Type Name and Title)

\_\_\_\_\_  
Surety

WITNESS:

By: \_\_\_\_\_ (Seal)

Attorney-In-Fact

\_\_\_\_\_  
(Type Name and Title)

**SURETY: Affix seal and attach current power of attorney)**

ROANOKE REGIONAL AIRPORT COMMISSION

LABOR AND MATERIAL PAYMENT BOND FOR CONSTRUCTION PROJECT

KNOW ALL MEN BY THESE PRESENTS: that

\_\_\_\_\_  
(Insert full name or legal title and address of contractor)

as Principal (hereinafter referred to as "Contractor"), and

\_\_\_\_\_  
(Insert full name or legal title and address of surety)

as Surety (hereinafter referred to as "Surety")

a corporation duly organized under the laws of the State of \_\_\_\_\_ and legally authorized to do business in the Commonwealth of Virginia, are held and firmly bound unto the Roanoke Regional Airport Commission, 5202 Aviation Drive, Roanoke, Virginia 24012 as Obligee (hereinafter referred to as "Commission"), in the amount of \_\_\_\_\_ DOLLARS (\$\_\_\_\_\_.00), for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

WHEREAS, Contractor has entered into a contract with Commission dated \_\_\_\_\_ for Bid No. 20-004 for the Building 51 Tenant Upgrades Construction Project ("Project") at Roanoke Regional Airport, in accordance with all contract documents for such Project, including, without limitation and as may be applicable, the Advertisement, Invitation to Bid, Instructions to Bidders, General Conditions, Supplementary Conditions, completed Bid Forms, Specifications, Plans and Drawings, if any, and the completed contract form, as well as all other covenants, agreements, and obligations to be performed or paid by Contractor, which documents are referred to collectively as the "Contract" and are expressly incorporated herein by reference and made a part of this bond.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Contractor shall promptly pay or cause to be paid all persons and entities for all labor and materials furnished or supplied in furtherance of the Project and provided for in the Contract, as determined by Commission, then this obligation shall be null and void; otherwise, this obligation and all provisions of this bond shall remain in full force and effect as stated herein.

- a. If Contractor shall fail to promptly pay or cause to be paid all persons and entities

for all labor and materials furnished or supplied in furtherance of the Project and provided for in the Contract, as determined by Commission, Surety shall defend, indemnify, and hold Commission harmless from and against any and all liability, loss, cost, damage, or expense, including reasonable attorney's fees, which Commission may incur or which may result from or be imposed upon Commission by reason of such failure.

- b. Any alteration, amendment, modification, omission, addition, extension, or forbearance which may be made in or to the terms of the Contract, including, without limitation, the amount to be paid or the obligations to be performed under it, or the giving by the Commission of any extension of time for the performance of the Contract or any other forbearance of any nature whatsoever on the part of either the Commission or the Contractor to the other shall not in any way affect or release the Contractor and/or the Surety, or their heirs, executors, administrators, successors or assigns with regard to their obligations and liability hereunder. Notice of any such alteration, amendment, modification, omission, addition, extension, or forbearance is hereby expressly waived by Surety. Any delay, omission, or failure by Commission to call upon the Surety in any instance shall not release the Surety from any obligation hereunder.
- c. Surety and Contractor hereby jointly and severally agree that this bond shall be for the protection of claimants who have and fulfill contracts to supply labor or materials, or both, to the Contractor or to any subcontractors, in furtherance of the work provided for in the Contract and shall be conditioned upon the prompt payment for all materials furnished or labor supplied or performed in furtherance of the work. "Labor and materials" hereunder shall include, without limitation, public utility services and reasonable rentals of equipment, but only for periods when the equipment rented is actually used at the Project site.

Any claimant who has a direct contractual relationship with the Contractor and who has performed labor or furnished material in accordance with the Contract in furtherance of the work provided in the Contract for which this bond has been given, and who has not been paid in full before the expiration of 90 days after the day on which the claimant performed the last of the labor or furnished the last of the materials for which it claims payment, may bring an action on this bond to recover any amount due it for the labor or material. The obligee named in the bond need not be named a party to the action.

Any claimant who has a direct contractual relationship with any subcontractor but who has no contractual relationship, express or implied, with the Contractor, may bring an action on this bond only if it has given written notice to the Contractor within 90 days from the day on which the claimant performed the last of the labor or furnished the last of the materials for which it claims payment, stating with substantial accuracy the amount claimed and the name of the person for whom the work was performed or to whom the material was furnished. Notice to the Contractor shall be served by registered or certified mail, postage prepaid, in an

envelope addressed to such contractor at any place where its office is regularly maintained for the transaction of business. Claims for sums withheld as retainages with respect to labor performed or materials furnished, shall not be subject to the time limitations stated in this subsection.

Any action on this bond shall be brought within one year after the day on which the person bringing such action last performed labor or last furnished or supplied materials.

The parties intend that the provisions hereof describing who is entitled to bring an action as a claimant on this bond shall be consistent with sections 2.2-4337.A.2 and 2.2-4341 of the Virginia Public Procurement Act, Code of Virginia (1950), as amended ("Act"). To the extent any provision hereof describing who is entitled to bring an action as claimant on this bond is not consistent with any provision of sections 2.2-4337.A.2 and/or 2.2-4341, the provision(s) of those sections of the Act, as amended, shall govern and control.

- d. Any suit or action hereunder shall be brought in a Virginia court of competent jurisdiction in and for the City of Roanoke, Virginia or in the United States District Court for the Western District of Virginia, Roanoke Division, and not elsewhere.
- e. This bond shall continue in full force and effect and shall not be deemed canceled or to have expired unless and until all of Contractor's obligations to make payments for labor and materials provided, furnished or supplied in furtherance of the Project have been satisfactorily fulfilled, as determined by Commission, or this bond is otherwise terminated in accordance with its terms or applicable law.
- f. The obligations evidenced herein shall constitute the joint and several obligations of the Contractor, the Surety, and their respective heirs, executors, administrators, successors and assigns.
- g. The provisions of this bond shall be governed by and are intended to be consistent with the laws of the Commonwealth of Virginia. In light of this express choice of law provision, Virginia law for determining governing law shall not apply to the provisions of this bond. The Contractor, for itself and its successors and assigns, and the Surety, for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the Commission to require a bond containing the provisions contained herein, and they do hereby further expressly waive any defense which they or either of them might interpose to any action brought hereon upon the ground that there is no law authorizing the Commission to require the provisions herein.
- h. Wherever possible, each provision of this bond shall be interpreted in such manner as to be effective and valid under applicable law. If any provision of this bond is held illegal or unenforceable in a judicial proceeding, such provision shall be severed and shall be inoperative, and all remaining provisions of this bond shall

remain operative and binding on the parties.

- i. This bond shall be construed and interpreted without regard to the identity of the party which drafted its various provisions. Every provision of this bond shall be construed as if all parties participated equally in the drafting of that provision. Any legal principle or rule of construction that a document is to be construed or interpreted against the drafting party shall not be applicable in any legal or other proceeding involving the provisions of this bond, and such principle or rule is expressly waived by the parties to this bond.
- j. Each party to this bond represents and covenants that the individual executing this bond on its behalf has full, unconditional authority to execute this bond and that, upon the signing of the bond by the authorized individual for each party, this bond shall become binding upon all parties

SIGNED and SEALED this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_, in the presence of:

	_____
	Contractor
WITNESS:	By: _____ (Seal)
_____	_____
	(Type Name and Title)
	_____
	Surety
WITNESS:	By: _____ (Seal)
_____	_____
	Attorney-In-Fact
	_____
	(Type Name and Title)

**(SURETY: Affix seal and attach current power of attorney)**



**CONTRACTOR'S PARTIAL INTERIM LIEN WAIVER AND RELEASE UPON  
PROGRESS PAYMENT**

\_\_\_\_\_ (“Contractor”) hereby certifies that it has furnished or will furnish certain labor, materials, or equipment for and in connection with the Cargo Ramp Repairs Project (“Project”) at Roanoke Regional Airport, Roanoke, VA. In consideration of payments to date and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, including the promises contained herein and upon the Roanoke Regional Airport Commission (“Owner”) making payment in the amount of \$ \_\_\_\_\_ on Application for Payment dated \_\_\_\_\_, 20\_\_\_\_, (“Application for Payment”), the undersigned waives and releases any right which it now has or in the future may have to claim a mechanic’s lien or any other lien rights, and waives and releases any and all claims of any kind for any labor, services, equipment, materials and anything whatsoever related to the Project or its performance (whether billed or unbilled) included on or covered by the Application for Payment and all previously paid Applications for Payment through the date hereof, except for any retainage amount shown on the Application for Payment, including, without limitation, any claims and/or liens for labor, services, equipment, materials, (including materials and equipment purchased, but not yet installed), and related taxes, against: (i) the real property where the Project is located; (ii) the improvements and other property located thereon; (iii) the Owner and its employees, officers, board members, and agents; and (iv) Project funds.

In order to induce payment to be made to the undersigned, the undersigned certifies to the Owner and agrees that: (i) the work for the Project to date has been completed in accordance with the Project contract documents; (ii) Contractor has fully paid all of its subcontractor, suppliers, and employees for all items connected with or related to the above-referenced Project and for all amounts owned for any work or materials covered by or included in payments which the Contractor has received for the Project up to and including the date hereof; and, (iii) Contractor shall defend, reimburse, indemnify and hold harmless the Owner, its employees, officers, board members, and agents, should any such claim, lien, or right to a lien be asserted by the Contractor, any subcontractor, or any person or entity acting for or claiming by, through, or under the Contractor or any subcontractor, including, without limitation, reasonable attorney’s fees and costs related there.

The undersigned has executed this waiver voluntarily and with full knowledge of the undersigned’s rights of law.

Dated: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Sworn and subscribed to before me this the \_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary Public:

My Commission Expires: \_\_\_\_\_

**FINAL LIEN AND CLAIMS RELEASE**  
**BUILDING 51 TENANT UPGRADES PROJECT**  
**AT**  
**ROANOKE REGIONAL AIRPORT**  
**ROANOKE, VIRGINIA**

**RRAC Project No. 20-004**

\_\_\_\_\_(Contractor) hereby certifies that the work for the above project has been completed in accordance with the Contract Documents, and that all previous progress payments received from the Owner on account of work performed under the Contract referred to has been applied by the undersigned to discharge in full all obligations of the undersigned incurred in connection with the work covered by prior requisitions for payment under said Contract and that all materials and equipment covered by the final requisition for payment are free and clear of all liens, claims, security interests and encumbrances. All persons, firms and partnerships who have furnished labor and/or material to date on said project have been paid.

\_\_\_\_\_  
Contractor

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Subscribed and sworn to before me in the \_\_\_\_\_, State of \_\_\_\_\_, this day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
My Commission expires

**WARRANTY OF CONSTRUCTION**  
**BUILDING 51 TENANT UPGRADES PROJECT**  
**AT**  
**ROANOKE REGIONAL AIRPORT**  
**ROANOKE, VIRGINIA**

**RRAC Project No. 20-004**

\_\_\_\_\_(Contractor) hereby expressly warrants and guarantees that all labor and material furnished and work performed under the above Contract are in accordance with the contract drawings and specifications and authorized alterations and additions thereto, and that as set forth in the Contract Documents, including without limitation, Section 33 of the General Conditions, all of the work under the Contract is free from faulty or defective materials and improper or defective workmanship, and are merchantable and fit for the purpose intended and guaranteed against injury from proper and usual wear, and should the work or material fail, or any defect develop due to improper or defective materials or workmanship, Contractor shall upon written notice, replace or repair such defective work or materials, together with any other work affected in making such corrections at Contractor's sole expense, including without limitation, cost of labor, material and/or travel, at the convenience of, and without any expense of any kind to the Owner for a period of one year (1) from the date of final acceptance. It is covenanted and agreed that this warranty shall be in addition to and not in lieu of any other applicable warranties, expressed or implied.

\_\_\_\_\_  
(Contractor)

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Subscribed and sworn to before me in the \_\_\_\_\_, State of \_\_\_\_\_,  
this day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
My Commission expires

**CERTIFICATE OF FINAL ACCEPTANCE**  
**BUILDING 51 TENANT UPGRADES PROJECT**  
**AT**  
**ROANOKE REGIONAL AIRPORT**  
**ROANOKE, VIRGINIA**  
**RRAC Project No. 20-004**

Contract Date: \_\_\_\_\_ Contract Amount: \$ \_\_\_\_\_  
Final Construction Cost: \$ \_\_\_\_\_

This Certificate of Final Acceptance applies to all Work under the Contract Documents and approved Change Orders for the above referenced Project completed by \_\_\_\_\_ (Contractor) for the Roanoke Regional Airport Commission (Owner).

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR, and ENGINEER, and that Work is hereby accepted as complete on \_\_\_\_\_ (Date).

The following documents and information are attached to and made a part of this Certificate:

1. Warranty of Construction
2. Lien and Claims Release

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

Accepted by CONTRACTOR \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

Accepted by OWNER \_\_\_\_\_

By: \_\_\_\_\_ Date: \_\_\_\_\_

# DRAWING INDEX

## SECTION E

### DRAWING TITLE:

### DRAWING NUMBER:

#### GENERAL

TITLE SHEET

TITLE SHEET

SHEET INDEX & PROJECT DATA

T001

T002

LIFE SAFETY

LIFE SAFETY PLAN

LS101

DEMOLITION

FLOOR PLAN -DEMOLITION

AD101

ARCHITECTURAL

NOTES, LEGENDS, & ABBREVIATIONS

FIRST FLOOR PLAN

FINISH SCHEDULES, NOTES, & LEGEND

FINISH PLAN

FURNITURE LAYOUT (FOR REFERENCE ONLY)

OPENING SCHEDULE

REFLECTED CEILING PLANS

A001

A101

A701

A702

A703

A711

A801

PLUMBING

PLUMBING DETAILS

WASTE & VENT PIPING PLAN

WATER PIPING PLAN

P001

P101

P102

MECHANICAL

HVAC LEGENDS, NOTES & SCHEDULES

MECHANICAL FLOOR PLAN - HVAC DEMO

MECHANICAL FLOOR PLAN - PIPING DEMO

M001

MD101

MD102

ELECTRICAL

ELECTRICAL LEGEND, ABBREVIATIONS, AND

GENERAL NOTES

LIGHTING DEMOLITION PLAN

POWER DEMOLITION PLAN

LOW VOLTAGE DEMOLITION PLAN

LIGHTING PLAN

POWER PLAN

LOW VOLTAGE PLAN

DETAILS

ONE-LINE DIAGRAM - EXISTING

SCHEDULES

E001

ED101

ED201

ED301

E101

E201

E301

E501

E601

E701



# TECHNICAL SPECIFICATIONS

## SECTION F







THOMPSON  
& LITTON

**REQUEST FOR ELECTRONIC FILES**

T&L PROJECT NUMBER: 12813

PROJECT NAME: Building 51 – Tenant Upgrade

FILES REQUESTED: \_\_\_\_\_

AUTOCAD VERSION REQUESTED: \_\_\_\_\_

The undersigned organization accepts the following provisions regarding use of the requested electronic files:

- A. The undersigned agrees not to reuse these electronic files, in part or in whole, for any purpose or project other than the above referenced project.
- B. The undersigned agrees to waive all claims against Thompson & Litton resulting in any way from any unauthorized changes or reuse of these electronic files for any other project by anyone other than Thompson & Litton.
- C. The undersigned is aware that significant differences may exist between the electronic files delivered and the respective construction documents due to addenda, change orders, or other revisions. In the event of a conflict between the signed construction documents prepared by Thompson & Litton and electronic files, the signed construction documents shall govern.
- D. The undersigned agrees that any subcontractors to the undersigned which utilize these electronic files will be bound by all of the above provisions.

Signed by: \_\_\_\_\_

Title: \_\_\_\_\_

Firm Name: \_\_\_\_\_

Date: \_\_\_\_\_




**PAYMENT APPLICATION CHECKLIST**

*(must be submitted by Contractor with each Application for Payment)*

APPLICATION FOR PAYMENT NO.: \_\_\_\_\_

PROJECT NAME: Building 51 – Tenant Upgrade

T&L PROJECT NO.: 12813

CONTRACTOR NAME: \_\_\_\_\_

**FIRST PAYMENT APPLICATION (IN ADDITION TO PROGRESS PAY APPLICATIONS ITEMS BELOW):**

- SCHEDULE OF VALUES HAS BEEN SUBMITTED AND APPROVED
- FIELD OFFICE IS IN PLACE (IF APPLICABLE)
- SUBCONTRACTOR LIST HAS BEEN SUBMITTED
- PROJECT/BUSINESS SIGN SKETCH(ES) SUBMITTED AND APPROVED

**PROGRESS PAYMENT APPLICATIONS:**

- CONSTRUCTION PHOTOGRAPHS
- CONSTRUCTION PROGRESS SCHEDULE (N/A FOR FINAL PAY APPS)
- WEATHER DELAY REQUEST
- ALL APPLICABLE SUPPORTING DOCUMENTATION
- AFFIDAVIT ATTESTING TO OFF-SITE STORED PRODUCTS (IF APPLICABLE)
- SUSTAINABLE DESIGN DOCUMENTATION (IF APPLICABLE)

**FINAL PAYMENT APPLICATION (IN ADDITION TO PROGRESS PAY APPLICATION ITEMS ABOVE):**

- O&M DATA (IF APPLICABLE)
- GUARANTEES & WARRANTIES (IF APPLICABLE)
- PROJECT RECORD DOCUMENTS
- SPARE PARTS AND MAINTENANCE MATERIALS (IF APPLICABLE)
- LIST OF MANUFACTURERS, SUPPLIERS, SUBCONTRACTORS AND INSTALLERS WITH ADDRESSES/PHONE NOS.
- AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS
- AFFIDAVIT OF RELEASE OF LIENS
- CONSENT OF SURETY TO FINAL PAYMENT
- FINAL INSPECTION CONDUCTED AND PUNCH LIST ITEMS ADDRESSED
- FINAL CLEANING CONDUCTED





# AIA Document G702™ - 1992

## Application and Certificate for Payment

TO OWNER: PROJECT: APPLICATION NO: DISTRIBUTION TO:

PERIOD TO: OWNER

FROM CONTRACTOR: VIA ARCHITECT: CONTRACT FOR: ARCHITECT

CONTRACT DATE: CONTRACTOR

PROJECT NOS: FIELD

OTHER

### CONTRACTOR'S APPLICATION FOR PAYMENT

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

1. ORIGINAL CONTRACT SUM ..... \$
2. NET CHANGE BY CHANGE ORDERS ..... \$
3. CONTRACT SUM TO DATE (Line 1 + 2) ..... \$
4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) ..... \$

#### 5. RETAINAGE:

- a. \_\_\_\_\_ % of Completed Work  
(Columns D + E on G703)
- b. \_\_\_\_\_ % of Stored Material  
(Column F on G703)

Total Retainage (Lines 5a + 5b, or Total in Column I of G703) ..... \$

#### 6. TOTAL EARNED LESS RETAINAGE

(Line 4 minus Line 5 Total) ..... \$

#### 7. LESS PREVIOUS CERTIFICATES FOR PAYMENT

(Line 6 from prior Certificate) ..... \$

#### 8. CURRENT PAYMENT DUE

(Line 3 minus Line 6) ..... \$

#### 9. BALANCE TO FINISH, INCLUDING RETAINAGE

(Line 3 minus Line 6) ..... \$

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	\$	\$
Total approved this month	\$	\$
TOTAL	\$	\$
NET CHANGES by Change Order	\$	\$

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

#### CONTRACTOR:

By: \_\_\_\_\_ Date: \_\_\_\_\_

State of: \_\_\_\_\_

County of: \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_

Notary Public:

My commission expires: \_\_\_\_\_

### ARCHITECT'S CERTIFICATE FOR PAYMENT

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

AMOUNT CERTIFIED ..... \$

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

#### ARCHITECT:

By: \_\_\_\_\_ Date: \_\_\_\_\_

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

**CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.**

AIA Document G702™ - 1992. Copyright © 1953, 1963, 1971, 1978, 1983 and 1992 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.** Purchasers are permitted to reproduce ten (10) copies of this document when completed. To report copyright violations of AIA Contract Documents, e-mail The American Institute of Architects' legal counsel, copyright@aia.org.











THOMPSON  
& LITTON

## REQUEST FOR INFORMATION

RFI NO. \_\_\_\_\_

TO: Thompson & Litton, Inc.  
726 Auburn Avenue  
Radford, VA 24141  
FAX: (540) 633-1896  
Email: mturner@T-L.com

From: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: \_\_\_\_\_

Please Respond By: \_\_\_\_\_

T&L Project No.: 12813  
Project Name: Building 51 - Tenant Upgrade

---

We request the following information/clarification:

SIGNED: \_\_\_\_\_ TITLE: \_\_\_\_\_

---

T&L RESPONSE:

BY: \_\_\_\_\_ DATE: \_\_\_\_\_





# REQUEST FOR SUBSTITUTION

USE SEPARATE FORM FOR EACH SUBMITTAL

Note: Requests for Substitution will be considered after project award.

DATE: \_\_\_\_\_

TO: \_\_\_\_\_

PROJECT NAME : Building 51 – Tenant Upgrade NO: 12813

NAME AND ADDRESS OF CONTRACTOR

\_\_\_\_\_

\_\_\_\_\_

HEREBY REQUESTS APPROVAL OF THE FOLLOWING PRODUCT OR SYSTEM AS AN "APPROVED EQUAL"

NAME AND DESCRIPTION OF SPECIFIED PRODUCT OR SYSTEM:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

SPECIFICATION SECTION NO. \_\_\_\_\_ PAGE(S) \_\_\_\_\_ PARAGRAPH(S) \_\_\_\_\_

DRAWING NO.(S) \_\_\_\_\_ DETAILS OR SECTION NO.(S) \_\_\_\_\_

NAME AND DESCRIPTION OF SUBMITTAL FOR SUBSTITUTION:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NAME OF MANUFACTURER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_ TELEPHONE: \_\_\_\_\_

NAME OF VENDOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_ TELEPHONE: \_\_\_\_\_

**REASON FOR NOT-GIVING PRIORITY TO SPECIFIED ITEMS:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**SUBSTITUTION AFFECTS OTHER MATERIALS OR SYSTEMS:**

YES\_\_\_ NO\_\_\_ IF YES, ATTACH COMPLETE DATA

**SUBSTITUTION REQUIRES DIMENSIONAL REV. OR REDESIGN OF STRUCTURE OR M&E REV:**

YES\_\_\_ NO\_\_\_ IF YES, ATTACH COMPLETE DATA

**SAVING OR CREDIT TO OWNER FOR ACCEPTING SUBSTITUTION:**

\$ \_\_\_\_\_

**THE ATTACHED DATA IS FURNISHED HERewith FOR EVALUATION OF THE SUBSTITUTION:**

CATALOG\_\_\_\_\_ DRAWINGS\_\_\_\_\_ EXAMPLES\_\_\_\_\_ TESTS\_\_\_\_\_ REPORTS\_\_\_\_\_

OTHER\_\_\_\_\_

**THE UNDERSIGNED HEREBY CERTIFIES THAT THIS SUBMISSION HAS BEEN FULLY CHECKED AND COORDINATED WITH THE CONTRACT DOCUMENTS:**

\_\_\_\_\_ BY: \_\_\_\_\_  
CONTRACTOR NAME

*For Use by Thompson & Litton:*

This Request is:        \_\_\_\_\_ Approved  
                                      \_\_\_\_\_ Denied

Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_

## SECTION 01 1000 - SUMMARY

### PART 1 GENERAL

#### 1.1 PROJECT

- A. Project Name: 12813 Building 51 - Tenant Upgrade
- B. Owner's Name: Roanoke Regional Airport Commission (RRAC).
- C. The Project consists of the alteration of Building 51, 1410 Coulton Street, Roanoke, Virginia for the primary use of a call center with general offices, conference room and accessory spaces. Included are renovations to the existing restrooms, mechanical, electrical, and fire suppression systems. Asbestos abatement is also included in the project.

#### 1.2 CONTRACT DESCRIPTION

#### 1.3 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.
- B. Owner will remove the following items before start of work:
  - 1. {CH#2460}.

#### 1.4 OWNER OCCUPANCY

- A. Owner intends to occupy the Project upon Substantial Completion.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

#### 1.5 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
  - 1. Locate and conduct construction activities in ways that will limit disturbance to site.
- B. Provide access to and from site as required by law and by Owner:
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
  - 2. Do not obstruct roadways, sidewalks, or other public ways without permit.

#### 1.6 WORK SEQUENCE

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

Summary	12813	01 1000 1
---------	-------	-----------



## SECTION 01 2200 - UNIT PRICES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

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

#### 1.2 RELATED REQUIREMENTS

- A. Document 00 2113 - Instructions to Bidders: Instructions for preparation of pricing for Unit Prices.

#### 1.3 COSTS INCLUDED

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

#### 1.4 UNIT QUANTITIES SPECIFIED

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

#### 1.5 MEASUREMENT OF QUANTITIES

- A. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.
- C. Measurement by Area: Measured by square dimension using mean length and width or radius.
- D. Contractor's Engineer Responsibilities: Sign surveyor's field notes or keep duplicate field notes , calculate and certify quantities for payment purposes.

#### 1.6 PAYMENT

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

#### 1.7 SCHEDULE OF UNIT PRICES

- A. Item: No. 1; Removal of Asbestos Containing Tile Mastic as described in the Asbestos Survey completed by ECS on May 6, 2015. Refer to Appendix A of this Project Manual.
  - 1. Description: Unit Price to adjust final Contract Price for quantity more or less than bid quantity.
  - 2. Unit of Measure: SF, square feet.
- B. Item No. 2: Removal of Asbestos Containing Floor Tile as described in the Asbestos Survey completed by ECS on May 6, 2015. Refer to Appendix A of this Project Manual.
  - 1. Description: Unit Price to adjust final Contract Price for quantity more or less than bid quantity.

Unit Prices	12813	01 2200 2
-------------	-------	-----------

2. Unit of Measure: SF, square feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

Unit Prices	12813	01 2200 2
-------------	-------	-----------



## SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information and project closeout.
- F. Requests for Interpretation (RFI) procedures.
- G. Submittal procedures.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 6000 - Product Requirements: General product requirements.
- B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- C. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

#### 1.3 REFERENCE STANDARDS

- A. AIA G716 - Request for Information 2004.

#### 1.4 GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
  - 1. Requests for Interpretation (RFI).
  - 2. Requests for substitution.
  - 3. Shop drawings, product data, and samples.
  - 4. Test and inspection reports.
  - 5. Design data.
  - 6. Manufacturer's instructions and field reports.
  - 7. Applications for payment and change order requests.
  - 8. Progress schedules.
  - 9. Coordination drawings.
  - 10. Correction Punch List and Final Correction Punch List for Substantial Completion.
  - 11. Closeout submittals.

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION

Administrative Requirements	12813	01 3000 7
-----------------------------	-------	-----------

### 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. Submission of initial Submittal schedule.
  - 6. Designation of personnel representing the parties to Contract.
  - 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 8. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

### 3.2 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
  - 1. Contractor.
  - 2. Owner.
  - 3. Architect.
  - 4. Contractor's superintendent.
  - 5. Major subcontractors.
- D. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems that impede, or will impede, planned progress.

5. Review of submittals schedule and status of submittals.
  6. Maintenance of progress schedule.
  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.
- E. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

### 3.3 CONSTRUCTION PROGRESS SCHEDULE

- A. Within 10 days after date of the 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. Submit updated schedule with each Application for Payment.

### 3.4 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  1. Prepare a separate RFI for each specific item.
    - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
    - b. Do not forward requests which solely require internal coordination between subcontractors.
  2. Prepare in a format and with content acceptable to Owner.
    - a. T&L RFI Form.
  3. Prepare using an electronic version of the form appended to this section.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
  - 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
  - 2. Note dates of when each request is made, and when a response is received.
- G. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
  - 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

### 3.5 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.

### 3.6 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 compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed 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 01 7800 - Closeout Submittals.

### 3.7 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.

### 3.8 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.
- D. Submit for Owner's benefit during and after project completion.

### 3.9 SUBMITTAL PROCEDURES

- A. General Requirements:
  - 1. Use a separate transmittal for each item.
  - 2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
  - 3. 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.
    - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
  - 4. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    - a. Send submittals in electronic format via email to Architect.
  - 5. Schedule submittals to expedite the Project, and coordinate submission of related items.
    - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
  - 6. Provide space for Contractor and Architect review stamps.
  - 7. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B. Product Data Procedures:
  - 1. Submit only information required by individual specification sections.

2. Collect required information into a single submittal.
  3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
  2. Use of reproductions of Contract Documents in digital data form to create shop drawings is only permitted as defined.
  3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
- D. Samples Procedures:
1. Transmit related items together as single package.
  2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
  3. Provide actual samples of finishes. Finish selections will not be made from electronic files

### 3.10 SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
    - a. "No Exceptions Taken", or language with same legal meaning. No corrections have been made to the submittal.
    - b. "Make Corrections Noted", or language with same legal meaning.
      - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
    - c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
  2. Not Authorizing fabrication, delivery, and installation:
    - a. "Revise and Resubmit".
      - 1) Resubmit revised item, with review notations acknowledged and incorporated.
- E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
    - a. "Received" - to notify the Contractor that the submittal has been received for record only.

2. Items for which action was taken:
  - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION





## SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures and fencing.
- D. Security requirements.
- E. Waste removal facilities and services.

#### 1.2 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2019b.

#### 1.3 TEMPORARY UTILITIES

- A. Owner will provide the following:
  - 1. Electrical power and metering, consisting of connection to existing facilities.
  - 2. Water supply, consisting of connection to existing facilities.

#### 1.4 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

#### 1.5 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### 1.6 FENCING

- A. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

#### 1.7 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material

outside the structure unless otherwise approved by the authorities having jurisdiction.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

## SECTION 01 6000 - PRODUCT REQUIREMENTS

### PART 1 GENERAL

#### 1.1 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

#### 1.2 SUBMITTALS

- A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

### PART 2 PRODUCTS

#### 2.1 NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
- C. Where other criteria are met, Contractor shall give preference to products that:
  - 1. If used on interior, have lower emissions, as defined in Section 01 6116.
  - 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.

#### 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.

### PART 3 EXECUTION

#### 3.1 TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

### 3.2 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.
- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

## SECTION 01 6116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

#### 1.2 DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
  - 1. Interior paints and coatings applied on site.
  - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
  - 3. Flooring.
  - 4. Products making up wall and ceiling assemblies.
  - 5. Thermal and acoustical insulation.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
  - 1. Interior paints and coatings applied on site.
  - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
  - 1. Concrete.
  - 2. Clay brick.
  - 3. Metals that are plated, anodized, or powder-coated.
  - 4. Glass.
  - 5. Ceramics.
  - 6. Solid wood flooring that is unfinished and untreated.

#### 1.3 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

Volatile Organic Compound (VOC) Content Restrictions	12813	01 6116 3
--	-------	-----------

- B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2018).
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers 2017, v1.2.
- D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2007.
- E. CHPS (HPPD) - High Performance Products Database Current Edition at [www.chps.net/](http://www.chps.net/).
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.
- G. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).
- H. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).
- I. SCS (CPD) - SCS Certified Products Current Edition.
- J. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

#### 1.5 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
  - 1. Wet-Applied Products: State amount applied in mass per surface area.
  - 2. Paints and Coatings: Test tinted products, not just tinting bases.
  - 3. Evidence of Compliance: Acceptable types of evidence are the following;
    - a. Current UL (GGG) certification.
    - b. Current SCS (CPD) Floorscore certification.
    - c. Current SCS (CPD) Indoor Advantage Gold certification.
    - d. Current listing in CHPS (HPPD) as a low-emitting product.
    - e. Current CRI (GLP) certification.
    - f. Test report showing compliance and stating exposure scenario used.
  - 4. Product data submittal showing VOC content is NOT acceptable evidence.
  - 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
  - 1. Evidence of Compliance: Acceptable types of evidence are:

Volatile Organic Compound (VOC) Content Restrictions	12813	01 6116 3
--	-------	-----------

- a. Report of laboratory testing performed in accordance with requirements.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
  - 1. Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
  - 1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
  - 2. Joint Sealants: SCAQMD 1168 Rule.
  - 3. Paints and Coatings: Each color; most stringent of the following:
    - a. 40 CFR 59, Subpart D.
    - b. SCAQMD 1113 Rule.
    - c. CARB (SCM).

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.
- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

Volatile Organic Compound (VOC) Content Restrictions	12813	01 6116 3
--	-------	-----------





## SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

### PART 1 GENERAL

#### 1.1 QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

#### 1.2 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

#### 1.3 COORDINATION

- A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Notify affected utility companies and comply with their requirements.
- C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- F. Coordinate completion and clean-up of work of separate sections.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

### 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 proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

### 3.3 LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. Periodically verify layouts by same means.
- H. Maintain a complete and accurate log of control and survey work as it progresses.

### 3.4 GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

### 3.5 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. Perform whatever cutting and patching is necessary to:
  1. Complete the work.
  2. Fit products together to integrate with other work.
  3. Provide openings for penetration of mechanical, electrical, and other services.
  4. Match work that has been cut to adjacent work.
  5. Repair areas adjacent to cuts to required condition.
  6. Repair new work damaged by subsequent work.
  7. Remove samples of installed work for testing when requested.
  8. Remove and replace defective and non-complying work.
- C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- F. Restore work with new products in accordance with requirements of Contract Documents.
- G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
- I. Patching:
  1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
  2. Match color, texture, and appearance.

Execution and Closeout Requirements	12813	01 7000 5
-------------------------------------	-------	-----------

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

### 3.6 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### 3.7 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### 3.8 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

### 3.9 FINAL CLEANING

- A. Use cleaning materials that are nonhazardous.
- 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. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- E. Clean filters of operating equipment.

- F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### 3.10 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

### 3.11 MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

Execution and Closeout Requirements	12813	01 7000 5
-------------------------------------	-------	-----------



## SECTION 01 7800 - CLOSEOUT SUBMITTALS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. 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.
- B. Operation and Maintenance Data:
  - 1. Submit two copies of preliminary draft or proposed 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 one 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 days after final inspection.
- C. Warranties and Bonds:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

### PART 2 PRODUCTS - NOT USED

Closeout Submittals	12813	01 7800 3
---------------------	-------	-----------

## 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. Addenda.
  - 3. 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 from documents used for construction.
- D. Record information concurrent with construction progress.
- E. 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. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

### 3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

### 3.4 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.



- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

### 3.5 WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION



## SECTION 02 4100 - DEMOLITION

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 1000 - Summary: Sequencing and staging requirements.
- C. Section 01 1000 - Summary: Description of items to be removed by Owner.
- D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- E. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

#### 1.3 REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2019.

#### 1.4 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

### PART 2 PRODUCTS -- NOT USED

### PART 3 EXECUTION

#### 3.1 SCOPE

- A. Remove other items indicated, for salvage, relocation and recycling.

#### 3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 01 7000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Comply with applicable requirements of NFPA 241.
  - 3. Use of explosives is not permitted.
  - 4. 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.
  - 5. Provide, erect, and maintain temporary barriers and security devices.

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.
  9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
  - D. Do not begin removal until built elements to be salvaged or relocated have been removed.
  - E. Protect existing structures and other elements that are not to be removed.
    1. Provide bracing and shoring.
    2. Prevent movement or settlement of adjacent structures.
    3. Stop work immediately if adjacent structures appear to be in danger.
  - F. Perform demolition in a manner that maximizes salvage and recycling of materials.
    1. Dismantle existing construction and separate materials.
    2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

### 3.3 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.
- 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.

### 3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  1. Verify that construction and utility arrangements are as indicated.
  2. Report discrepancies to Architect before disturbing existing installation.

3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
- C. Remove existing work as indicated and as required to accomplish new work.
  1. Remove items indicated on drawings.
- D. Services (Including but not limited to {CH#126875}): Remove existing systems and equipment as indicated.
  1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
  2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
  3. Verify that abandoned services serve only abandoned facilities before removal.
  4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
  1. Prevent movement of structure; provide shoring and bracing if necessary.
  2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  3. Repair adjacent construction and finishes damaged during removal work.
  4. Patch as specified for patching new work.

### 3.5 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION



## SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.
- C. Factory finishing.

#### 1.2 RELATED REQUIREMENTS

- A. Section 12 3600 - Countertops.

#### 1.3 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2018).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2016, with Errata (2018).
- C. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.
- D. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

### PART 2 PRODUCTS

#### 2.1 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets:
  - 1. Cabinet Style: Flush overlay.
  - 2. Cabinet Doors and Drawer Fronts: Flush style.
  - 3. Drawer Side Construction: Multiple-dovetailed.
  - 4. Drawer Construction Technique: Dovetail joints.

#### 2.2 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

#### 2.3 LAMINATE MATERIALS

- A. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- B. Provide specific types as indicated.
  - 1. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness, through color, finish as indicated.
  - 2. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, through color, finish as indicated.

## 2.4 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
  - 1. Color: As selected by Architect from manufacturer's standard range.
  - 2. Use at all exposed plywood edges.
  - 3. Use at all exposed shelf edges.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

## 2.5 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
- C. Fixed Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:
  - 1. Material: Steel.
  - 2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
  - 3. Color: Black.
- D. Fixed Specialty Vanity Brackets:
  - 1. Material: Steel.
  - 2. Finish: Manufacturer's standard, factory-applied, textured powder coat.
  - 3. Color: White.
- E. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers ("U" shaped wire pull, steel with chrome finish, 100 mm centers).
- F. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish. Provide on all drawers and cabinets.
- G. Catches: Magnetic.
- H. Drawer Slides:
  - 1. Type: Extension types as indicated.
  - 2. Static Load Capacity: Commercial grade.
  - 3. Mounting: Side mounted.
  - 4. Stops: Integral type.
  - 5. Features: Provide self closing/stay closed type.
- I. Hinges: European style concealed self-closing type, steel with polished finish.



## 2.6 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

## 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. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Secure cabinets to floor using appropriate angles and anchorages.

### 3.3 ADJUSTING

- A. Adjust installed work.
- B. 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 07 9200 - JOINT SEALANTS

### PART 2 PRODUCTS

#### 1.1 JOINT SEALANT APPLICATIONS

##### A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
  - a. Wall expansion and control joints.
  - b. Joints between door, window, and other frames and adjacent construction.
  - c. Joints between different exposed materials.
  - d. Openings below ledge angles in masonry.
  - e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
  - a. Joints between door, window, and other frames and adjacent construction.
  - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
  - c. Other joints indicated below.
3. Do not seal the following types of joints.
  - a. Intentional weepholes in masonry.
  - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
  - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
  - d. Joints where installation of sealant is specified in another section.
  - e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

1. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

#### 1.2 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 6116.

B. Colors: TBD.

### 1.3 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 35 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.

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.

C. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).

### 1.4 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.

## PART 3 EXECUTION

### 2.1 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.

### 2.2 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.

### 2.3 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 ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. 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.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION



## SECTION 08 1213 - HOLLOW METAL FRAMES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.
- B. Interior glazed borrowed lite frames.

#### 1.2 RELATED REQUIREMENTS

- A. Section 08 7110 - Door Hardware Schedule: Hardware, silencers and weatherstripping.
- B. Section 08 8000 - Glazing: Glazed borrowed lites.

#### 1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.
- C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2003 (R2009).
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.
- G. ASTM A879/A879M - Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface 2012 (Reapproved 2017).
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.
- J. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
- L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.
- M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

- N. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2007.
- O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
- D. Samples: Submit one sample of frame metal, 2 inch by 2 inch (50 mm by 50 mm), showing factory finishes, colors, and surface textures.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store in accordance with applicable requirements and in compliance with standards and/or custom guidelines as indicated.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Door Frame Type: Provide hollow metal door frames with applied casings.
  - 1. See drawings for locations of each type of frame.
- B. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
- C. Accessibility: Comply with ICC A117.1 and ADA Standards.
- D. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
- E. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- F. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- G. Frames for Interior Glazing or Borrowed Lites: Construction and face dimensions to match door frames, and as indicated on drawings.



## 2.2 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Interior Door Frames, Non-Fire Rated: Knock-down type.
  - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    - a. Level 1 - Standard-duty.
    - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    - c. Frame Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.

## 2.3 HOLLOW METAL DOOR FRAMES WITH APPLIED CASINGS

- A. Frame Type: Knockdown, slip-on drywall frames; separate jambs and head with separate snap-on casings both sides; factory-applied finish on exposed surfaces.
  - 1. Frame Material: Cold-rolled steel complying with ASTM A1008/A1008M.
  - 2. Casing Material: Formed steel.
  - 3. Casing Profile: As indicated.
  - 4. Finish: Factory-applied baked enamel finish, or electrostatically applied water-based paint.
    - a. Color: As selected from manufacturer's full line.
- B. Interior Door Frames, Non-Fire-Rated:
  - 1. Frame Metal Thickness: 18 gage, 0.042 inch (1.0 mm), minimum.
  - 2. Frames in Wet Areas: Electro-galvanize components prior to finishing in accordance with ASTM A879/A879M, with manufacturer's standard coating thickness.

## 2.4 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

## 2.5 ACCESSORIES

- A. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

### 3.2 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Comply with glazing installation requirements of Section 08 8000.

D. Install door hardware as specified in Section 08 7110.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Coordinate installation of electrical connections to electrical hardware items.

### 3.3 TOLERANCES

- A. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edges, crossed corner to corner.

### 3.4 SCHEDULE - SEE DRAWINGS

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

## SECTION 08 1416 - FLUSH WOOD DOORS

### PART 1 GENERAL

#### 1.1 RELATED REQUIREMENTS

- A. Section 08 1213 - Hollow Metal Frames.
- B. Section 08 8000 - Glazing.

### PART 2 PRODUCTS

#### 2.1 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
  - 1. Provide solid core doors at each location.

#### 2.2 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

#### 2.3 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Natural birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

#### 2.4 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
  - 1. Provide solid blocks at lock edge for hardware reinforcement.
  - 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.

#### 2.5 FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
  - 1. Transparent:
    - a. System - 1, Lacquer, Nitrocellulose.
    - b. Sheen: Flat.
- B. Factory finish doors in accordance with approved sample.

Flush Wood Doors	12813	08 1416 2
------------------	-------	-----------

- C. Seal door top edge with color sealer to match door facing.

## 2.6 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 1213.
- B. Glazed Openings:
  - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
  - 2. Glazing: Single vision units, 1/4 inch (6.4 mm) thick glass.
  - 3. Tint: Clear.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

## 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 specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

### 3.3 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

### 3.4 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

## SECTION 08 3100 - ACCESS DOORS AND PANELS

### PART 1 GENERAL

### PART 2 PRODUCTS

#### 2.1 ACCESS DOORS AND PANELS ASSEMBLIES

##### A. Wall-Mounted Units:

1. Location: As indicated on drawings.
2. Panel Material: Aluminum extrusions with gypsum board inlay.
3. Size: 12 inch by 12 inch (305 mm by 305 mm).
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

##### B. Wall-Mounted Units in Wet Areas:

1. Location: As indicated on drawings.
2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
3. Size: 12 inch by 12 inch (305 mm by 305 mm).
4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

##### C. Ceiling-Mounted Units:

1. Location: As indicated on drawings.
2. Panel Material: Aluminum extrusion with gypsum board inlay.
3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
4. Size - Other Ceilings: 12 inch by 12 inch (305 mm by 305 mm).

#### 2.2 WALL AND CEILING MOUNTED ACCESS UNITS

##### A. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Door Style: Single thickness with rolled or turned in edges.
2. Frames: 16 gage, 0.0598 inch (1.52 mm), minimum thickness.
3. Single Steel Sheet Door Panels: 1/16 inch (1.6 mm), minimum thickness.
4. Door/Panel Size: As indicated on the drawings.
5. Hardware:

- a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
- b. Latch/Lock: Tamperproof tool-operated cam latch.

## 2.3 WALL AND CEILING MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

- A. Gypsum Board Inlay Access Panels: Provide rectangular and square access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable and free-pivoting hinge.
  1. Rectangular Panel Frame Size: 24 by 36 inch (610 by 914 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
  2. Square Panel Frame Size: 24 by 24 inch (610 by 610 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
  3. Panel Frame: 1 inch (25.4 mm) margin with concealed countersunk screw mounting.
- B. Air Return Grille: Linear bar grille fitted with flush and concealed perimeter frame.
  1. Grille: Fixed grilles with 1/4 inch (6.4 mm) thick by 5/8 inch (15.9 mm) deep bars at 1/2 inch (12.7 mm) on center providing 48 percent free space opening.
  2. Grille Size: 12 by 12 inch (12.7 by 12.7 mm) set within 1/2 inch (12.7 mm) thick gypsum board.
  3. Fabrication: Aluminum with factory powder coated finish.
  4. Grille Frame: 1 inch (25.4 mm) margin with concealed countersunk screw mounting.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

## SECTION 08 4313 - ALUMINUM-FRAMED STOREFRONTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

#### 1.2 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. Section 08 7110 - Door Hardware Schedule: Hardware items other than specified in this section.
- C. Section 08 8000 - Glazing: Glass and glazing accessories.

#### 1.3 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site 2015.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.
- E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
- F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.
- G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

- D. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

#### 1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

### PART 2 PRODUCTS

#### 2.1 STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
  - 1. Glazing Position: Centered (front to back).
  - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (50 mm wide by 114 mm deep).
  - 3. Finish: Superior performing organic coatings.
    - a. Factory finish all surfaces that will be exposed in completed assemblies.
    - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
  - 4. Finish Color: {CH#51572}.
  - 5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
  - 6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
  - 7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
  - 8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.



9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
  - a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).
3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.

## 2.2 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

1. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 8000.

C. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches (43 mm).
2. Top Rail: 4 inches (100 mm) wide.
3. Vertical Stiles: 4-1/2 inches (115 mm) wide.
4. Bottom Rail: 10 inches (254 mm) wide.
5. Glazing Stops: Square.
6. Finish: Same as storefront.

## 2.3 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

## 2.4 FINISHES

A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80

percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).

## 2.5 HARDWARE

- A. For each door, include weatherstripping, sill sweep strip and threshold.
- B. Other Door Hardware: As specified in Section 08 7110.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
- E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

### 3.2 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Set thresholds in bed of sealant and secure.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

### 3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

### 3.4 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.5 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION



## SECTION 08 7110 - DOOR HARDWARE SCHEDULE

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Hardware for wood, aluminum and hollow metal doors.
- B. Hardware Schedule.

#### 1.2 RELATED REQUIREMENTS

- A. Section 08 1213 - Hollow Metal Frames.
- B. Section 08 7100 Door Hardware: Hardware components described in the schedule in

#### 1.3 REFERENCE STANDARDS

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Provide door hardware specified, or as required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide items of a single type of the same model by the same manufacturer.
- C. Provide products that comply with the following:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. Hardware for Smoke and Draft Control Doors(Indicated as "S" on Drawings): Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code. Located at attic draftstop door.
  - 3. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.
- D. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.

#### 2.2 LOCKS AND LATCHES

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
  - 1. If no hardware set is indicated for a swinging door provide an office lockset.
  - 2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
  - 3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
  - 1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Keyed in like-groups.

- D. Latches: Provide a latch for every door that is not required to lock, unless specifically indicated "push/pull" or "not required to latch".

## 2.3 HINGES

- A. Hinges: Provide hinges on every swinging door.
  - 1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
  - 2. Provide ball-bearing hinges at all doors having closers.
  - 3. Provide hinges in the quantities indicated.
  - 4. Provide non-removable pins on exterior outswinging doors.
  - 5. Where electrified hardware is mounted in door leaf, provide power transfer hinges.

## HARDWARE SETS

### 3.1 HARDWARE SETS - GENERAL

- A. These Hardware Sets indicate requirements for single doors of that type, with conditional requirements for pairs and other situations.
- B. Pairs of Swinging Doors: Provide one of each specified item on each leaf unless specifically stated otherwise. Treat pairs as two active leaves unless otherwise indicated.

### 3.2 HARDWARE SETS- SCHEDULE

- A.
  - 1. HW-1: Entrance doors, (double), manual lock/unlock.
    - a. Continuous geared hinges.
    - b. Exit device (each leaf).
    - c. Mortise cylinder.
    - d. Rim cylinder.
    - e. Permanent core.
    - f. Door pull.
    - g. Overhead stop.
    - h. Automatic operator.
    - i. Weather Ring.
    - j. Dual Wall mounted actuator.
    - k. Pedestal with actuator.
    - l. Door sweep.
    - m. Door gasketing.
    - n. Aluminum threshold.
    - o. Door Notes.
      - 1) Gasketing shall be provided by Manufacturer / Supplier of Aluminum Doors and Frame. Doors 101A and 101B to operate as follows:

2) Door 101A to be manually unlocked/locked by Own during occupied hours of operation. Door to have a handicapped push button actuator on a pedestal on the exterior. Inside the vestibule 101, there will be a card swipe to open door 101B at anytime and a handicapped push button dual activator interior door 101B when activated. A video phone is to be provided and upon acceptance of entrant, the handicapped push button will be activated. Refer to electrical drawings for buzzer locations (2).

2. HW-1A:

- a. Continuous geared hinges.
- b. Exit device (each leaf).
- c. Mortise cylinder.
- d. Rim cylinder.
- e. Permanent core.
- f. Door pull.
- g. Overhead stop.
- h. Automatic operator.
- i. Door position switch.
- j. Dual wall mounted actuator.
- k. Wall mounted actuator.
- l. Aluminum threshold.
- m. Electric Strike.
- n. Coordinator.
- o. See Door Notes under Hardware Set HW-1 above.

3. HW-2: Entrance door (single) always locked, release by card reader.

- a. Continuous geared hinge
- b. Exit device (each leaf).
- c. Mortise cylinder.
- d. Rim cylinder.
- e. Permanent core.
- f. Door pull.
- g. Overhead stop.
- h. Automatic operator.
- i. Door position switch.
- j. Door sweep.
- k. Door gasketing.
- l. Aluminum threshold.

- m. Electric strike.
- 4. HW-3: Office doors.
  - a. 3 ea butt hinge.
  - b. Office lockset.
  - c. Permanent Core.
  - d. Wall stop.
  - e. Silencer.
- 5. HW-4: Entrance (double doors)
  - a. 3 ea butt hinge.
  - b. Entrance lockset.
  - c. Permanent Core.
  - d. Overhead Stop.
  - e. Silencers.
- 6. HW-5: Passage Set.
  - a. 3 ea butt hinges.
  - b. Passage lockset.
  - c. overhead stop.
  - d. Silencers.
- 7. HW-6 Storage.
  - a. 3 ea butt hinges.
  - b. Storage lockset.
  - c. Overhead stop.
  - d. Silencers.
- 8. HW-7 Entrance (single doors).
  - a. 3 ea butt hinge.
  - b. Office lockset.
  - c. permanent core.
  - d. Overhead stop.
  - e. Sweeps.

END OF SECTION



## SECTION 08 8000 - GLAZING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.

#### 1.2 RELATED REQUIREMENTS

- A. Section 08 1213 - Hollow Metal Frames: Glazed borrowed lites.
- B. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.
- C. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.
- D. Section 08 8723- Safety and Security Films

#### 1.3 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015.
- C. ASTM C1036 - Standard Specification for Flat Glass 2016.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.
- E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2015.
- F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.
- G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.
- H. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2017.
- I. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2014, with Errata (2017).
- J. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2017.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Certificate: Certify that products of this section meet or exceed specified requirements.

Glazing	12813	08 8000 4
---------	-------	-----------

- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

#### 1.5 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

#### 1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

### PART 2 PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
  - 1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
  - 2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
  - 3. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
  - 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
  - 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
  - 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
  - 3. Solar Optical Properties: Comply with NFRC 300 test method.

#### 2.2 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

## 2.3 INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated.
  1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
  2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
  3. Spacer Color: Black.
  4. Edge Seal:
    - a. Color: Black.
  5. Purge interpane space with dry air, hermetically sealed.
- B. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
  1. Applications: Exterior glazing unless otherwise indicated.
  2. Space between lites filled with air.
  3. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
    - a. Tint: Clear.
  4. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
    - a. Tint: Clear.
  5. Total Thickness: 1 inch (25.4 mm).
  6. Thermal Transmittance (U-Value), Summer - Center of Glass: , nominal.

## 2.4 GLAZING UNITS

- A. Type G-2 - Monolithic Interior Vision Glazing:
  1. Applications: Interior glazing unless otherwise indicated.
  2. Glass Type: Annealed float glass.
  3. Tint: Clear.
  4. Thickness: 1/4 inch (6.4 mm), nominal.
- B. Type G-5 - Monolithic Safety Glazing: Non-fire-rated.
  1. Applications:
    - a. Glazed lites in doors, except fire doors.
    - b. Glazed sidelights to doors, except in fire-rated walls and partitions.

- c. Other locations required by applicable federal, state, and local codes and regulations.
- d. Other locations indicated on drawings.
- 2. Glass Type: Fully tempered safety glass as specified.
- 3. Tint: Clear.
- 4. Thickness: 1/4 inch (6.4 mm), nominal.

END OF SECTION

## SECTION 08 8723 - SAFETY AND SECURITY FILMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Glazing film applied to existing and new exterior glazing assemblies.
- B. Glazing assemblies to receive film are indicated on drawings.

### PART 2 PRODUCTS

#### 2.1 SAFETY AND SECURITY GLAZING FILM

- A. Safety Glazing: Retrofit existing glazing assemblies to provide impact resistance complying with ANSI Z97.1 and 16 CFR 1201, Category II.
  - 1. Surface applied film.
  - 2. Requiring no supplemental anchoring devices.

#### 2.2 MATERIALS

- A. Glazing Film: Transparent polyester film for permanent bonding to glass.
  - 1. Thickness: 0.008 inch (0.2 mm), minimum.
  - 2. Color: Clear.
  - 3. Construction: Multi-ply laminate.
  - 4. Adhesive Type: Pressure sensitive acrylic.
  - 5. Longitudinal Tensile Strength: 22,000 psi.
  - 6. Traverse Tensile Strength: 25,000 psi.
  - 7. Yield Strength: 12,000 psi.
  - 8. Elongation at yield: 3%.
  - 9. Longitudinal Elongation at break: 90%.
  - 10. Traverse Elongation at break: 75%.
- B. Accessory Materials: As recommended or required by film manufacturer.
- C. Glass Cleaner: As recommended by glazing film manufacturer.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Field -Applied Film: Verify that existing conditions are adequate for proper application and performance of film.
- B. Examine glass and frames. Verify that existing conditions are adequate for proper application and performance of film.
- C. Verify glass is not cracked, chipped, broken, or damaged.
- D. Verify that frames are securely anchored and free of defects.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.2 PREPARATION

- A. Clean glass of dust, dirt, paint, oil, grease, mildew, mold, and other contaminants that would inhibit adhesion.
- B. Immediately prior to applying film, thoroughly wash glass with neutral cleaning solution.
- C. Protect adjacent surfaces.
- D. Do not begin installation until substrates have been properly prepared.

### 3.3 INSTALLATION

- A. Do not apply glazing film when surface temperature is less than 40 degrees F (4 degrees C) or if precipitation is imminent.
- B. Install in accordance with manufacturer's instructions, without air bubbles, wrinkles, streaks, bands, thin spots, pinholes, or gaps, as required to achieve specified performance.
- C. Accurately cut film with straight edges to required sizes allowing 1/16 inch (2 mm) to 1/8 inch (3 mm) gap at perimeter of glazed panel unless otherwise required by anchorage method.
- D. Seams: Seam film only as required to accommodate material sizes; form seams vertically without overlaps and gaps; do not install with horizontal seams.
- E. Clean glass and anchoring accessories following installation. Remove excess sealants and other glazing materials from adjacent finished surfaces.
- F. Remove labels and protective covers.

### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

## SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Acoustic insulation.
- D. Cementitious backing board.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

### PART 2 PRODUCTS

#### 2.1 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
  - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

#### 2.2 METAL FRAMING MATERIALS

- A. Non-structural Steel Framing for Application of Gypsum Board: As specified in Section 09 2216.
- B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
  - 1. Studs: "C" shaped with flat or formed webs with knurled faces.
  - 2. Runners: U shaped, sized to match studs.
  - 3. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
- C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.
- D. Non-structural Framing Accessories:
  - 1. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
    - a. Materials: ASTM A36/A36M formed sheet steel support member with factory-welded ASTM A1003/A1003M steel plate base.

2. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

### 2.3 BOARD MATERIALS

- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    - a. Mold resistant board is required restrooms above tile.
  3. Thickness:
    - a. Vertical Surfaces: 5/8 inch (16 mm).
- B. Backing Board For Wet Areas: One of the following products:
  1. Application: Surfaces behind tile in wet areas.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  3. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
    - a. Thickness: 1/2 inch (12.7 mm).
- C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Ceilings, unless otherwise indicated.
  2. Thickness: 1/2 inch (13 mm).
  3. Edges: Tapered.

### 2.4 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 1/2" .
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Beads, Joint Accessories and Other Trim: ASTM C1047, rigid plastic, galvanized steel or rolled zinc, unless noted otherwise.
  1. Corner Beads: Low profile, for 90 degree outside corners.
  2. Expansion Joints:
    - a. Type: V-shaped PVC with tear away fins.
- D. Moisture Guard Trim: ASTM C1047, rigid plastic, 48 inch (1219.2 mm) length, applied to bottom edge of gypsum board.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
  1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
  2. Joint Compound: Drying type, vinyl-based, ready-mixed.



- F. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

### 3.2 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Studs: Space studs at 16 inches on center (at 406 mm on center).
  - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
  - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
  - 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

### 3.3 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
  - 1. Place one bead continuously on substrate before installation of perimeter framing members.
  - 2. Seal around all penetrations by conduit, pipe, ducts and rough-in boxes, except where firestopping is provided.

### 3.4 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- D. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

### 3.5 INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
  - 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Moisture Guard Trim: Install on bottom edge of gypsum board according to manufacturer's instructions and in locations indicated on drawings.

### 3.6 JOINT TREATMENT

- A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
- B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

### 3.7 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

## SECTION 09 3000 - TILING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Stone thresholds.
- E. Non-ceramic trim.

#### 1.2 REFERENCE STANDARDS

- A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar 2017.
- B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar 2017.
- C. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement 1999 (Reaffirmed 2016).
- D. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive 2009 (Revised).
- E. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).
- F. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy 1999 (Reaffirmed 2010).
- G. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout 1999 (Reaffirmed 2010).
- H. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout 1999 (Reaffirmed 2010).
- I. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework 2017.
- J. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2018.
- K. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar 1999 (Reaffirmed 2010).

- L. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone 2005 (Reaffirmed 2016).
- M. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar 2017.
- N. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive 2013 (Revised).
- O. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).
- P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile 2012.
- Q. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products 2018.
- R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation 2019.

### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories and setting details.
- D. Samples: One sample of each product indicated on the drawings.

## PART 2 PRODUCTS

### 2.1 TILE

- A. Manufacturers: All products by the same manufacturer.
  - 1. American Olean Corporation: [www.americanolean.com/#sle](http://www.americanolean.com/#sle).
  - 2. Dal-Tile Corporation: [www.daltile.com/#sle](http://www.daltile.com/#sle).
  - 3. Emser Tile, LLC: [www.emser.com/#sle](http://www.emser.com/#sle).
  - 4. Terrazzo & Marble Supply Companies: [www.tmsupply.com/#sle](http://www.tmsupply.com/#sle).
  - 5. Ceramic Technics LTD: [ceramictechnics.com](http://ceramictechnics.com): Basis of Design.
- B. Porcelain Tile, Type PT-1: ANSI A137.1 standard grade.
  - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
  - 2. Size: 12 by 24 inch (305 by 610 mm), nominal.
  - 3. Thickness: 3/8 inch (9.5 mm).

4. Edges: Cushioned.
  5. Surface Finish: Unglazed.
  6. Color(s): As indicated on drawings.
  7. Pattern: Ashlar.
- C. Porcelain Tile, Type PT-2: ANSI A137.1 standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
  2. Size: 4 by 12 inch (101 by 305 mm), nominal.
  3. Thickness: 3/8 inch (9.5 mm).
  4. Edges: Cushioned.
  5. Surface Finish: Unglazed.
  6. Color(s): As indicated on drawings.
  7. Pattern: Ashlar.
- D. Porcelain Tile, Type PT-3: ANSI A137.1 standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
  2. Size: 12 by 12 inch (305 by 305 mm), nominal.
  3. Thickness: 3/8 inch (9.5 mm).
  4. Edges: Cushioned.
  5. Surface Finish: Polished.
  6. Color(s): As indicated on drawings.
  7. Pattern: Linear.
- E. Porcelain Tile, Type PT-4: ANSI A137.1 standard grade.
1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
  2. Size: 4 by 24 inch (101 by 610 mm), nominal.
  3. Thickness: 3/8 inch (9.5 mm).
  4. Edges: Bullnose.
  5. Surface Finish: Unglazed.
  6. Color(s): As indicated on drawings.
  7. Pattern: Ashlar.

## 2.2 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin brass anodized extruded aluminum, style and dimensions to suit application, edge trim.
1. Applications:
    - a. Wall corners, outside and inside.

- 1) AL-1: At wall base: Schluter AHKA100ACGB.
  - 2) AL-2: Outside Bullnose: Schluter RONDEC.
2. Manufacturers:
- a. Schluter-Systems: [www.schluter.com/#sle](http://www.schluter.com/#sle).
- B. Thresholds: Marble, white, honed finish; 2 inches (51 mm) wide by full width of wall or frame opening; 1/2 inch thick (12.7 mm thick); beveled one long edge with radiused corners on top side; without holes, cracks, or open seams.
1. Applications:
    - a. At doorways where tile terminates.
    - b. At open edges of floor tile where adjacent finish is a different height.

### 2.3 SETTING MATERIALS

- A. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
1. Products:
    - a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - b. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: [www.merkrete.com/#sle](http://www.merkrete.com/#sle).

### 2.4 GROUTS

- A. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Where indicated.
  2. Color(s): As selected by Architect from manufacturer's full line.
  3. Products:
    - a. ARDEX Engineered Cements; ARDEX WA: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).
    - b. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
    - c. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: [www.laticrete.com/#sle](http://www.laticrete.com/#sle).
    - d. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: [www.merkrete.com/#sle](http://www.merkrete.com/#sle).

### 2.5 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
  2. Color(s): As selected by Architect from manufacturer's full line.
  3. Products:
    - a. ARDEX Engineered Cements; ARDEX SX: [www.ardexamericas.com/#sle](http://www.ardexamericas.com/#sle).

- b. Custom Building Products; Commercial 100% Silicone Caulk:  
www.custombuildingproducts.com/#sle.
- c. LATICRETE International, Inc; LATICRETE LATASIL:  
www.laticrete.com/#sle.
- d. Merkrete, by Parex USA, Inc; Merkrete Colored Caulking:  
www.merkrete.com/#sle.

## 2.6 ACCESSORY MATERIALS

- A. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch (12.7 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that required floor-mounted utilities are in correct location.

### 3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

### 3.3 INSTALLATION - GENERAL

- A. Install tile, thresholds and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated.
- H. Sound tile after setting. Replace hollow sounding units.

- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

#### 3.4 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
  - 1. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F131.

#### 3.5 INSTALLATION - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

#### 3.6 CLEANING

- A. Clean tile and grout surfaces.

#### 3.7 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION



## SECTION 09 5100 - ACOUSTICAL CEILINGS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acoustic Tiles/Panels:
  - 1. Armstrong World Industries, Inc: [www.armstrongceilings.com/#sle](http://www.armstrongceilings.com/#sle).
  - 2. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 3. USG Corporation: [www.usg.com/ceilings/#sle](http://www.usg.com/ceilings/#sle).
- B. Suspension Systems:
  - 1. Same as for acoustical units.

#### 2.2 ACOUSTICAL UNITS

- A. Acoustical Panels, Type ACT-1: Painted mineral fiber, with the following characteristics:
  - 1. Classification: ASTM E1264 Type III.
  - 2. Size: 24 by 24 inches (610 by 610 mm).
  - 3. Thickness: 3/4 inch (19 mm).
  - 4. Panel Edge: Square.
  - 5. Color: White.
  - 6. Suspension System: Exposed grid.

#### 2.3 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips and splices as required.
- B. Exposed Suspension System: Aluminum grid and cap; factory-applied closed-cell foam gaskets.
  - 1. Structural Classification: Light-duty, when tested in accordance with ASTM C635/C635M.
  - 2. Profile: Tee; 15/16 inch (24 mm) face width.
  - 3. Finish: Baked enamel.

### 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 PREPARATION

Acoustical Ceilings	12813	09 5100 2
---------------------	-------	-----------

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

### 3.3 INSTALLATION - SUSPENSION SYSTEM

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- B. Locate system on room axis according to reflected plan.
- C. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- F. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- G. Do not eccentrically load system or induce rotation of runners.

### 3.4 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 acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
  - 1. Make field cut edges of same profile as factory edges.

### 3.5 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

## SECTION 09 6500 - RESILIENT FLOORING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Static control resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

#### 1.3 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2017a.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile 2004 (Reapproved 2018).
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2018a.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base 2016.
- E. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2019.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).
- D. Protect roll materials from damage by storing on end.

### PART 2 PRODUCTS

#### 2.1 TILE FLOORING

- A. Vinyl Composition Tile{CH#288856}: {CH#288855}.

Resilient Flooring	12813	09 6500 4
--------------------	-------	-----------

1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
  2. Size: 12 by 12 inch (305 by 305 mm).
  3. VOC Content Limits: As specified in Section 01 6116.
  4. Thickness: 0.125 inch (3.2 mm).
  5. Color: To be selected by Architect from manufacturer's full range.
- B. Static Control Tile - Type SDT-1: Homogeneous; color and pattern throughout thickness.
1. Minimum Requirements: Solid vinyl tile complying with ASTM F1700, Class 1, Type A.
  2. Electrical Resistance:
    - a. Dissipative Tile: Resistance between 1.0 megohms and 1000 megohms as tested in accordance with ASTM F150.
  3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
  4. VOC Content Limits: As specified in Section 01 6116.
  5. Tile Size: 12 by 12 inch (305 by 305 mm).
  6. Total Thickness: 0.125 inch (3 mm).
  7. Color: To be selected by Architect from manufacturer's full range.

## 2.2 RESILIENT BASE

- A. Resilient Base - Type RB-1: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
1. Manufacturers:
    - a. Burke Flooring; Commercial Wall Base - TS: [www.burkeflooring.com/#sle](http://www.burkeflooring.com/#sle).
    - b. Johnsonite, a Tarkett Company: [www.johnsonite.com/#sle](http://www.johnsonite.com/#sle).
    - c. Roppe Corp: [www.roppe.com/#sle](http://www.roppe.com/#sle).
  2. Height: 4 inch (100 mm).
  3. Thickness: 0.125 inch (3.2 mm).
  4. Finish: Satin.
  5. Length: Roll.
  6. Color: To be selected by Architect from manufacturer's full range.

## 2.3 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
1. VOC Content Limits: As specified in Section 01 6116.

- C. Copper Grounding Strips: Type and size as recommended by static control flooring manufacturer.
- D. Filler for Coved Base: Plastic.
- E. Sealer and Wax: Types recommended by flooring manufacturer.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

#### 3.2 PREPARATION

- A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is fully cured.

#### 3.3 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
  1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 0526 for grounding and bonding to building grounding system.
  2. Fit joints and butt seams tightly.
  3. Set flooring in place, press with heavy roller to attain full adhesion.

#### 3.4 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

#### 3.5 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

#### 3.6 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

#### 3.7 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

## SECTION 09 6519 - RESILIENT TILE FLOORING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Installation accessories:
  - 1. Adhesives.
  - 2. Finishes and cleaners.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: SCS FloorScore certification documentation.
- B. Section 07 9200 - Joint Sealants.

#### 1.3 REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2016a.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2019.

### PART 2 PRODUCTS

#### 2.1 RESILIENT TILE FLOORING

- A. Luxury Vinyl Plank and Tile:
  - 1. Manufacturer: TAJ Flooring (Basis of Design)
  - 2. Style: Spectrum.
  - 3. Color: To be selected by Architect.
  - 4. Physical Properties:
    - a. Construction: Phthalate-free solid plank and tile made from 100 percent virgin vinyl.
    - b. Wear Layer Thickness: 28 mil (0.70 mm).
    - c. Total Thickness (Gauge): 0.126 inch (3.2 mm).
    - d. Finish: Urethane coating with ceramic bead particles.
  - 5. Manufacturing, Performance, and Safety Standards:

#### 2.2 ACCESSORIES

- A. Adhesives:
  - 1. VOC Content Limits: As specified in Section 01 6116.
- B. Finishes and Cleaners:
  - 1. VOC Content Limits: As specified in Section 01 6116.

### PART 3 EXECUTION

#### 3.1 EXAMINATION - SEE ALSO SECTION 01 7000.

- A. Install flooring and accessories after other operations (including painting) have been completed.
- B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
  - 1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH, cleanliness and other conditions are as required by the manufacturer, and ready to receive work.
- C. Verify that substrate is contaminant-free, including old adhesives and abatement chemicals.
- D. Test substrates as required by manufacturer to verify proper conditions exist.

### 3.2 PREPARATION

- A. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.
- B. Prepare per manufacturer's written instructions, Section 01 7000, and as follows:
  - 1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank & Tile.
  - 2. Concrete Substrates: Prepare substrate per ASTM F710.
    - a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
    - b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
      - 1) Do not use solvents or adhesive removers.
    - c. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
      - 1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
      - 2) Sand smooth per manufacturer's instructions.
    - d. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
    - e. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank & Tile. Underlayment compound shall be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M.
    - f. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.



3. Existing and Other Substrates:
  - a. Refer to manufacturer's professional installation guide and/or contact manufacturer, as special conditions may exist.

### 3.3 INSTALLATION

- A. Installation per manufacturer's written instructions, Section 01 7000, and as follows:
  1. Layout shall be specified by Architect, Designer or End User.
  2. Follow layout and ensure installation reference lines are square.
  3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
  4. Check cartons for and do not mix dye lots.
  5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
    - a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
    - b. Install movement joint systems per manufacturer's instructions and per Section 07 9200 and Section 07 9513.
  6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
    - a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
    - b. Periodically spot-check transfer of adhesive to back of tile during installation.
    - c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
    - d. Protect floor from traffic per manufacturer's instructions.
    - e. Do not wet mop floor until the adhesive has properly set per written instructions.

### 3.4 CLEANING

- A. Provide progress cleaning per manufacturer's written instructions, Section 01 7000, and as follows:
  1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
    - a. Clean and protect completed construction until Date of Substantial Completion.
    - b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
  2. Site: Maintain project site free of waste materials and debris.

- B. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 7000.
  - 1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
  - 2. Clean floor with a neutral 6-8 pH cleaner.

### 3.5 PROTECTION

- A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
  - 1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
  - 2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
  - 3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
  - 4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION

## SECTION 09 6813 - TILE CARPETING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Carpet tile, fully adhered.
- B. Removal of existing carpet tile.

#### 1.2 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

#### 1.3 REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source 2017a.
- B. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.
- C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source 2019.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

#### 1.5 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Tile Carpeting:
  - 1. Interface, Inc: [www.interface.com/#sle](http://www.interface.com/#sle).
  - 2. Milliken & Company: [www.milliken.com/#sle](http://www.milliken.com/#sle).
  - 3. Mohawk Group; Expedition Collection: [www.mohawkgroup.com/#sle](http://www.mohawkgroup.com/#sle).
  - 4. Mats Inc: [www.matsinc.com](http://www.matsinc.com)

#### 2.2 MATERIALS

- A. Tile Carpeting{CH#65579}: {CH#65580}, manufactured in one color dye lot.
  - 1. Tile Size: {CH#65586}, nominal.
  - 2. Color: {CH#65589}.
  - 3. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.

4. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
- B. Entrance Tile Carpeting, Type CPT-1.
1. Thickness: 1/2 inch.
  2. Size: 20 inch by 20 inch nominal.
  3. Pile Weight: 52 oz/sq yd.
  4. Total Weight: 141 oz/ sq yd.
  5. Material: 100% Solution dyed UV stabilized polypropylene fibers.

### 2.3 ACCESSORIES

- A. Edge Strips: Embossed aluminum.
- B. Adhesives:
1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

### 3.2 PREPARATION

- A. Remove existing carpet tile.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Vacuum clean substrate.

### 3.3 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Fully adhere carpet tile to substrate.
- H. Trim carpet tile neatly at walls and around interruptions.
- I. Complete installation of edge strips, concealing exposed edges.

### 3.4 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION



## SECTION 09 9123 - INTERIOR PAINTING

### PART 1 GENERAL

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
  - 1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
  - 2. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

#### 2.2 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
  - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at [www.paintinfo.com](http://www.paintinfo.com), for specified MPI categories, except as otherwise indicated.
  - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 3. Supply each paint material in quantity required to complete entire project's work from a single production run.
  - 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: To be selected from manufacturer's full range of available colors.
  - 1. Selection to be made by Architect after award of contract.
  - 2. Allow for minimum of four colors for each system, unless otherwise indicated, without additional cost to Owner.

#### 2.3 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel and aluminum.
  - 1. Two top coats and one coat primer.
  - 2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.

3. Top Coat Sheen:
    - a. Eggshell: MPI gloss level 3; use this sheen at all locations.
    - b. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
  4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Two top coats and one coat primer.
  2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.
  3. Top Coat Sheen:
    - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
- C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board.
1. Two top coats and one coat primer.
  2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
  3. Top Coat Sheen:
    - a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
  4. Primer: As recommended by top coat manufacturer for specific substrate.

#### 2.4 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.

#### 2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Gypsum Wallboard: 12 percent.



2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Concrete:
- F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Ferrous Metal:
  1. Solvent clean according to SSPC-SP 1.
  2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
  3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

### 3.3 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### 3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

### 3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### 3.6 PROTECTION

END OF SECTION

Interior Painting	12813	09 9123 4
-------------------	-------	-----------

## SECTION 10 1400 - SIGNAGE

### PART 2 PRODUCTS

#### 1.1 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
  - 1. Sign Type: Flat signs with engraved panel media as specified.
  - 2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
  - 3. Character Height: 1 inch (25 mm).
  - 4. Sign Height: 2 inches (50 mm), unless otherwise indicated.
  - 5. Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.
  - 6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
  - 7. Service Rooms: Identify with room names and numbers to be determined later, not those indicated on drawings.
  - 8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.

#### 1.2 SIGN TYPES

- A. Flat Signs: Signage media without frame.
  - 1. Edges: Square.
  - 2. Corners: Radiused.
  - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
  - 1. Character Font: Helvetica, Arial, or other sans serif font.
  - 2. Character Case: Upper case only.
  - 3. Background Color: Clear.
  - 4. Character Color: Contrasting color.

#### 1.3 TACTILE SIGNAGE MEDIA

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
  - 1. Total Thickness: 1/16 inch (1.6 mm).

#### 1.4 ACCESSORIES

Signage	12813	10 1400 2
---------	-------	-----------

- A. Tape Adhesive: Double sided tape, permanent adhesive.

### PART 3 EXECUTION

#### 2.1 EXAMINATION

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

#### 2.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

## SECTION 10 2113.19 - PLASTIC TOILET COMPARTMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Solid plastic toilet compartments.
- B. Urinal screens.

#### 1.2 RELATED REQUIREMENTS

- A. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

#### 1.3 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth 2019.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls.

#### 1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels, in size illustrating panel finish, color, and sheen.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
  - 1. All American Metal Corp - AAMCO: [www.allamericanmetal.com](http://www.allamericanmetal.com).
  - 2. Ampco Products, Inc: [www.ampco.com](http://www.ampco.com).
  - 3. Partition Systems International of South Carolina; PolyLife HDPE Toilet Partitions: [www.psisc.com](http://www.psisc.com).
  - 4. Scranton Products (Santana/Comtec/Capital): [www.scrantonproducts.com](http://www.scrantonproducts.com).

#### 2.2 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), tested in accordance with NFPA 286; floor-mounted unbraced.
  - 1. Color: To be selected by Architect.
  - 2. Doors:
    - a. Thickness: 1 inch (25 mm).
    - b. Width: 24 inch (610 mm).
    - c. Width for Handicapped Use: 36 inch (915 mm), out-swinging.

- d. Height: 55 inch (1397 mm).
- 3. Panels:
  - a. Thickness: 1 inch (25 mm).
  - b. Height: 55 inch (1397 mm).
- 4. Pilasters:
  - a. Thickness: 1 inch (25 mm).
  - b. Width: As required to fit space; minimum 3 inch (76 mm).
- 5. Screens: Without doors; to match compartments; mounted to wall with two panel brackets with vertical support/bracing same as compartments.

### 2.3 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
  - 1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
  - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
- E. Hinges: Stainless steel, manufacturer's standard finish.
  - 1. Continuous-type hinge, self closing.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
  - 1. Door Latch: Slide type with exterior emergency access feature.
  - 2. Provide door pull for outswinging doors.
- G. Coat Hook: One per compartment, mounted on door.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

#### 3.2 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

### 3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

### 3.4 ADJUSTING

- A. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

END OF SECTION





## SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 GENERAL

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
  - 1. American Specialties, Inc: [www.americanspecialties.com](http://www.americanspecialties.com).
  - 2. Bradley Corporation: [www.bradleycorp.com](http://www.bradleycorp.com).
  - 3. Georgia-Pacific Professional: [www.blue-connect.com/#sle](http://www.blue-connect.com/#sle).
- B. Diaper Changing Stations:
  - 1. American Specialties, Inc; [\_\_\_\_]: [www.americanspecialties.com/#sle](http://www.americanspecialties.com/#sle).
  - 2. Bradley Corporation; [\_\_\_\_]: [www.bradleycorp.com/#sle](http://www.bradleycorp.com/#sle).
  - 3. Koala Kare Products; [\_\_\_\_]: [www.koalabear.com/#sle](http://www.koalabear.com/#sle).

#### 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 anchor components for installation.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- D. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- E. Adhesive: Two component epoxy type, waterproof.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

#### 2.3 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

#### 2.4 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser: Double roll, surface mounted, for coreless type rolls.
- B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.
  - 1. Capacity: 300 C-fold minimum.
- C. Automated Soap Dispenser: Foam soap dispenser, deck-mounted on vanity, with container concealed below deck; chrome-plated brass with bright polished finish; chrome-plated deck escutcheon, battery powered.

Toilet, Bath, and Laundry Accessories	12813	10 2800 3
---------------------------------------	-------	-----------

1. Minimum Capacity: 27 ounces (0.80 liters).
- D. Mirrors: Frameless, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
  2. Size: As indicated on the drawings.
- E. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
    - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
    - b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
    - c. Length and Configuration: As indicated on drawings.
- F. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

## 2.5 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
1. Material: Polyethylene.
  2. Mounting: Surface.
  3. Color: Gray.
  4. Minimum Rated Load: 250 pounds (113.4 kg).

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

### 3.2 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
  1. Grab Bars: As indicated on drawings.
  2. Mirrors: 40 inches to bottom of mirrored surface.
  3. Other Accessories: As indicated on drawings.

### 3.3 PROTECTION

Toilet, Bath, and Laundry Accessories	12813	10 2800 3
---------------------------------------	-------	-----------

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

Toilet, Bath, and Laundry Accessories	12813	10 2800 3
---------------------------------------	-------	-----------



## SECTION 12 2400 - WINDOW SHADES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Interior manual roller shades.

#### 1.2 REFERENCE STANDARDS

- A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015.
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films 2019.
- C. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.
- D. WCMA A100.1 - Safety of Window Covering Products 2018.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
  - 1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
  - 2. Do not install shades until final surface finishes and painting are complete.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

#### 1.6 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
  - 1. Shade Hardware: One year.
  - 2. Fabric: One year.

### PART 2 PRODUCTS

#### 2.1 ROLLER SHADES

- A. General:
  - 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.

Window Shades	12813	12 2400 4
---------------	-------	-----------

2. Provide shade system that operates smoothly when shades are raised or lowered.
- B. Roller Shades:
- C. Roller Shades - Basis of Design: MechoShade Systems LLC; Mecho/5 System; [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle).
1. Description: Single roller, manually operated fabric window shades.
  2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
  3. Roller Tubes:
    - a. Material: Extruded aluminum.
    - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
    - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.
    - d. Roller tubes to be capable of being removed and reinstalled without affecting roller shade limit adjustments.
  4. Hembars: Designed to maintain bottom of shade straight and flat.
    - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
  5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
    - a. Provide a permanently lubricated brake assembly mounted on a oil-impregnated hub with wrapped spring clutch.
    - b. Brake must withstand minimum pull force of 50 pounds (22.7 kg) in the stopped position.
    - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
  6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 pound (43 kg) minimum breaking strength. Provide upper and lower limit stops.
    - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.

## 2.2 SHADE FABRIC

- A. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
1. Manufacturers:
    - a. MechoShade Systems LLC; EcoVeil Screens - 1350 Series (5% open): [www.mechoshade.com/#sle](http://www.mechoshade.com/#sle). Basis of Design
    - b. Mermet Corporation: [www.mermetusa.com/#sle](http://www.mermetusa.com/#sle).

- c. Phifer, Inc: [www.phifer.com/#sle](http://www.phifer.com/#sle).
- 2. Material: Vinyl coated polyester.
- 3. Material Certificates and Product Disclosures:
  - a. Low-Emitting Material Certification: Greenguard Gold certified and listed in UL (GGG).
- 4. Performance Requirements:
  - a. Flammability: Pass NFPA 701 large and small tests.
  - b. Fungal Resistance: No growth when tested according to ASTM G21.
  - c. Solar Transmittance (Ts): .10.
  - d. Visible Light Transmittance (Tv): .09.
  - e. Solar Absorption (As): .53.
  - f. Solar Reflectance (Rs): .37.
- 5. Openness Factor: 5%.
- 6. Color: 5309 Dove Gray.

### 2.3 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
  - 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
  - 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

### 3.3 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

### 3.4 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

### 3.5 PROTECTION

Window Shades	12813	12 2400 4
---------------	-------	-----------

A. Protect installed products from subsequent construction operations.

### 3.6 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION



## SECTION 12 3600 - COUNTERTOPS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Wall-hung counters and vanity tops.

### PART 2 PRODUCTS

#### 2.1 COUNTERTOPS

- A. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
  - 1. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
  - 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    - a. Manufacturers:
      - 1) Avonite Surfaces: [www.avonitesurfaces.com/#sle](http://www.avonitesurfaces.com/#sle).
      - 2) Dupont: [www.corian.com/#sle](http://www.corian.com/#sle).
      - 3) Formica Corporation: [www.formica.com/#sle](http://www.formica.com/#sle).
      - 4) Wilsonart: [www.wilsonart.com/#sle](http://www.wilsonart.com/#sle).
    - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
    - c. Color and Pattern: As selected by Architect from manufacturer's full line.
  - 3. Other Components Thickness: 1/2 inch (12 mm), minimum.
  - 4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch (32 mm) thick; square edge; use marine edge at sinks.
  - 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.

#### 2.2 MATERIALS

- A. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- C. Joint Sealant: Mildew-resistant silicone sealant, white.

#### 2.3 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
  - 1. Join lengths of tops using best method recommended by manufacturer.
  - 2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.

Countertops	12813	12 3600 2
-------------	-------	-----------

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
  1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
  2. Height: 4 inches (102 mm), unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

#### 3.2 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

#### 3.3 CLEANING

- A. Clean countertops surfaces thoroughly.

#### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

## SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

#### 1.2 REFERENCE STANDARDS

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### 1.3 SUBMITTALS

- A. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Shop Drawings:
  - 1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls.
  - 2. Submit shop drawings to authority having jurisdiction for approval. Submit proof of approval to Architect.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
  - 2. Sprinkler Wrenches: For each sprinkler type.

#### 1.4 QUALITY ASSURANCE

- A. Comply with FM (AG) requirements.
- B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- C. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

### PART 2 PRODUCTS

#### 2.1 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light hazard; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

#### 2.2 SPRINKLERS

Fire-Suppression Sprinkler Systems	12813	21 1300 2
------------------------------------	-------	-----------

- A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Upright type with guard.
  - 1. Response Type: Quick.
  - 2. Coverage Type: Standard.
  - 3. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

## 2.3 PIPING SPECIALTIES

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.
- F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- G. Flush entire piping system of foreign matter.
- H. Hydrostatically test entire system.
- I. Require test be witnessed by Fire Marshal.

END OF SECTION

Fire-Suppression Sprinkler Systems	12813	21 1300 2
------------------------------------	-------	-----------

## SECTION 22 0719 - PLUMBING PIPING INSULATION

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping: Placement of hangers and hanger inserts.

#### 1.3 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- C. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- D. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- E. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2013).
- F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- G. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation 2017.
- H. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
- I. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- J. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2017, with Editorial Revision (2018).
- K. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation 2019a.
- L. ASTM C610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation 2017.
- M. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2019b.
- O. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

- P. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- Q. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.

### PART 2 PRODUCTS

#### 2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255 or UL 723.

#### 2.2 GLASS FIBER

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. 'K' ('Ksi') value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum service temperature: 850 degrees F (454 degrees C).
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- B. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
  - 1. 'K' ('Ksi') value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum service temperature: 650 degrees F (343 degrees C).
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).
- D. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.
- E. Vapor Barrier Lap Adhesive:
  - 1. Compatible with insulation.
- F. Insulating Cement/Mastic:
  - 1. ASTM C195; hydraulic setting on mineral wool.
- G. Fibrous Glass Fabric:
  - 1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
  - 2. Blanket: 1.0 lb/cu ft (16 kg/cu m) density.
  - 3. Weave: 10x10.

- H. Indoor Vapor Barrier Finish:
  1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight.
  2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- I. Outdoor Vapor Barrier Mastic:
  1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- J. Outdoor Breather Mastic:
  1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Insulating Cement:
  1. ASTM C449/C449M.

### 2.3 CELLULAR GLASS

- A. Insulation: ASTM C552, Type 1.
  1. Apparent Thermal Conductivity; 'K' ('Ksi') value: Grade 6, 0.33 at 100 degrees F (0.047 at 38 degrees C).
  2. Service Temperature: Up to 800 degrees F (427 degrees C).
  3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/Pa s m).
  4. Water Absorption: 0.5 percent by volume, maximum.

### 2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  1. Minimum Service Temperature: -40 degrees F (-40 degrees C).
  2. Maximum Service Temperature: 220 degrees F (104 degrees C).
  3. Connection: Waterproof vapor barrier adhesive.

### 2.5 JACKETS

- A. PVC Plastic.
  1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F (-18 degrees C).
    - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
    - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 15 mil (0.38 mm).
    - e. Connections: Brush on welding adhesive.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  1. Thickness: 0.025 inch (0.64 mm) sheet.
  2. Finish: Smooth.
  3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.

4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. Glass fiber insulated pipes conveying fluids above ambient temperature:
  1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- G. Inserts and Shields:
  1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert location: Between support shield and piping and under the finish jacket.
  4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.



- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- I. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.
- J. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum or stainless steel jacket with seams located on bottom side of horizontal piping.
- K. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.
- L. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum or stainless steel jacket with seams located on bottom side of horizontal piping.

### 3.3 SCHEDULES

- A. Plumbing Systems:
  - 1. Domestic Hot Water Supply:
    - a. Glass Fiber Insulation:
      - 1) Thickness: 1" inch (25.4 mm).
  - 2. Domestic Cold Water: 1/2" thickness.

END OF SECTION



## SECTION 22 1005 - PLUMBING PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Flanges, unions, and couplings.
  - 4. Pipe hangers and supports.
  - 5. Valves.
  - 6. Water pressure reducing valves.

#### 1.2 RELATED REQUIREMENTS

- A. Section 22 0719 - Plumbing Piping Insulation.

#### 1.3 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems 2015.
- B. ANSI Z223.1 - National Fuel Gas Code 2016.
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2015.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2016.
- E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- G. ASME B31.9 - Building Services Piping 2017.
- H. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems 2009.
- I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- K. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2017.
- L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2019.
- M. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- N. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes 2015a.
- O. ASTM B302 - Standard Specification for Threadless Copper Pipe, Standard Sizes 2017.

- P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2014.
- S. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2015, with Editorial Revision (2018).
- T. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings 2004 (Reapproved 2016).
- U. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter 2012a.
- V. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2015.
- W. ASTM D2447 - Standard Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter; 2003.
- X. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 2017.
- Y. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2012 (Reapproved 2018).
- Z. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings 2014.
- AA. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2017.
- BB. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2015.
- CC. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings 2016.
- DD. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers 1992,with Editorial Revision (2018).
- EE. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing 2019a.
- FF. ASTM F877 - Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems 2019.
- GG. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe 2017.
- HH. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- II. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems 2010.

- JJ. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 2012.
- KK. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2017.
- LL. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).
- MM. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service 2017.
- NN. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).
- OO. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).
- PP. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends 2011.
- QQ. NSF 61 - Drinking Water System Components - Health Effects 2019.
- RR. NSF 372 - Drinking Water System Components - Lead Content 2016.
- SS. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe 2017.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

#### 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

#### 1.7 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

## 2.2 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

## 2.3 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. PVC Pipe: ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.
- C. PVC Pipe: ASTM D1785 Schedule 40, or ASTM D2241 SDR 26 for not less than 150 psi (1 034 kPa) pressure rating.
  - 1. Fittings: ASTM D2466, PVC.
  - 2. Joints: Solvent welded, with ASTM D2564 Solvent cement.

## 2.4 WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

- A. Copper Pipe: ASTM B42, annealed.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B 32, alloy Sn95 solder.

## 2.5 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
- B. Cross-Linked Polyethylene Pipe: ASTM F876 or ASTM F877.
  - 1. PPI TR-4 Pressure Design Basis:
    - a. 160 psig (1102 kPa) at maximum 73 degrees F (23 degrees C).
    - b. 100 psig (689 kPa) at maximum 180 degrees F (82 degrees C).
    - c. 80 psig (551 kPa) at maximum 200 degrees F (93 degrees C).
  - 2. Fittings: Brass and copper.
  - 3. Joints: Mechanical compression fittings.

## 2.6 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
  - 3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
  - 4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.
  - 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
  - 1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
  - 3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.
  - 4. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.
  - 5. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Other Types: As required.

## 2.7 BALL VALVES

- A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder, threaded or grooved ends with union.

## 2.8 PLUG VALVES

- A. Construction 2-1/2 Inches (65 mm) and Larger:  $\{rs\#1\}$ , 175 psi (1200 kPa) CWP, cast iron body and plug, pressure lubricated, teflon or Buna N packing, flanged ends. Provide lever operator with set screw.

## 2.9 BUTTERFLY VALVES

- A. Construction 1-1/2 Inches (40 mm) and Larger: MSS SP-67, 200 psi (1380 kPa) CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable Buna N seat, wafer ends, extended neck, 10 position lever handle.
- B. Provide gear operators for valves 8 inches (150 mm) and larger, and chain-wheel operators for valves mounted over 8 feet (2400 mm) above floor.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

#### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- E. Establish elevations of buried piping outside the building to ensure not less than 3 ft ([\_\_\_\_\_] m) of cover.
- F. Install valves with stems upright or horizontal, not inverted.
- G. Install water piping to ASME B31.9.
- H. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- I. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- J. Pipe Hangers and Supports:
  1. Install in accordance with ASME B31.9.
  2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
  3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

#### 3.3 APPLICATION

- A. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- B. Install globe valves for throttling, bypass, or manual flow control services.
- C. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.

#### 3.4 TOLERANCES



- A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/8 inch per foot (1:100) slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

### 3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

### 3.6 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve .
  - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

### 3.7 SCHEDULES

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
      - 1) Maximum hanger spacing: 6.5 ft (2 m).
      - 2) Hanger rod diameter: 3/8 inches (9 mm).
    - b. Pipe size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
      - 1) Maximum hanger spacing: 10 ft (3 m).
      - 2) Hanger rod diameter: 3/8 inch (9 mm).
    - c. Pipe size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
      - 1) Maximum hanger spacing: 10 ft (3 m).
      - 2) Hanger rod diameter: 1/2 inch (13 mm).
    - d. Pipe Size: 4 inches (100 mm) to 6 inches (150 mm):
      - 1) Maximum Hanger Spacing: 10 ft (3 m).
      - 2) Hanger Rod Diameter: 5/8 inch (15 mm).
  - 2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum hanger spacing: 6 ft (1.8 m).
      - 2) Hanger rod diameter: 3/8 inch (9 mm).

END OF SECTION

## SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Cleanouts.
- B. Water hammer arrestors.
- C. Thermostatic mixing valves.

#### 1.2 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 4000 - Plumbing Fixtures.
- C. Section 22 3000 - Plumbing Equipment.

#### 1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.6.3 - Floor and Trench Drains 2019.
- C. ASME A112.6.4 - Roof, Deck, and Balcony Drains 2008 (Reaffirmed 2012).
- D. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers 2017.
- E. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent 2009.
- F. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers 2011.
- G. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance 2011 (Reaffirmed 2016).
- H. NSF 61 - Drinking Water System Components - Health Effects 2019.
- I. NSF 372 - Drinking Water System Components - Lead Content 2016.
- J. PDI-WH 201 - Water Hammer Arresters 2017.

#### 1.4 SUBMITTALS

- A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept specialties on site in original factory packaging. Inspect for damage.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

### 2.2 DRAINS

- A. Floor Drain :
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

### 2.3 CLEANOUTS

- A. Cleanouts at Exterior Surfaced Areas :
  - 1. Round cast nickel bronze access frame and non-skid cover.
- B. Cleanouts at Exterior Unsurfaced Areas :
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- C. Cleanouts at Interior Finished Floor Areas :
  - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- D. Cleanouts at Interior Finished Wall Areas :
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

### 2.4 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors:
  - 1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F (-73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

### 2.5 MIXING VALVES

- A. Thermostatic Mixing Valves:
  - 1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved portable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatories sinks.

END OF SECTION



## SECTION 22 3000 - PLUMBING EQUIPMENT

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Water Heaters:
  - 1. Residential electric.

#### 1.2 REFERENCE STANDARDS

- A. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### 1.3 SUBMITTALS

- A. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- B. Shop Drawings:
  - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

#### 1.5 CERTIFICATIONS

- A. Water Tanks: ASME labeled, to ASME BPVC-VIII-1.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

#### 1.7 WARRANTY

- A. Provide five year manufacturer warranty for domestic water heaters.

## PART 2 PRODUCTS

### 2.1 WATER HEATERS

#### A. Residential Electric:

1. Type: Automatic, electric, vertical storage.
2. Performance:
  - a. Storage Capacity 40 gal.
  - b. Heating Element Size: 4.5 kW.
3. Electrical Characteristics:
  - a. 208 volts, single phase.
4. Tank: Glass lined welded steel, thermally insulated with one inch (25 mm) thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
5. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F (49 to 77 degrees C), flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
6. Accessories:
  - a. Water Connections: Brass.
  - b. Dip Tube: Brass.
  - c. Drain valve.
  - d. Anode: Magnesium.
  - e. Temperature and Pressure Relief Valve: ASME labeled.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.

END OF SECTION



## SECTION 22 4000 - PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Under-lavatory pipe supply covers.
- G. Electric water coolers.

#### 1.2 RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 1006 - Plumbing Piping Specialties.
- C. Section 22 3000 - Plumbing Equipment.

#### 1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- C. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration. 2013.
- D. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- E. ASME A112.18.1 - Plumbing Supply Fittings 2018.
- F. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- G. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- H. ASME A112.19.3 - Stainless Steel Plumbing Fixtures 2017.
- I. ASME A112.19.4M - Porcelain Enameled Formed Steel Plumbing Fixtures 1994 (R2009).
- J. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- K. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- L. NSF 61 - Drinking Water System Components - Health Effects 2019.
- M. NSF 372 - Drinking Water System Components - Lead Content 2016.

#### 1.4 SUBMITTALS

Plumbing Fixtures	12813	22 4000 5
-------------------	-------	-----------

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### 1.5 QUALITY ASSURANCE

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

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

#### 1.7 WARRANTY

- A. Provide five year manufacturer warranty for electric water cooler.

### PART 2 PRODUCTS

#### 2.1 GENERAL

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

#### 2.2 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  1. Bowl: ASME A112.19.2; 18" and 16.5" high with elongated rim.
  2. Flush Valve: Exposed (top spud).
  3. Flush Operation: Sensor operated.
  4. Handle Height: 44 inches (1117 mm) or less.
  5. Supply Size: 1-1/2 inches (38 mm).
  6. Color: White.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  1. Sensor-Operated Type: Solenoid or motor-driven operator, battery powered, infrared sensor with mechanical over-ride or over-ride push button.
  2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
- C. Seats:
  1. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

#### 2.3 WALL HUNG URINALS

- A. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

1. Flush Volume: 0.125 gallon (0.47 liter), maximum.
  2. Flush Style: Washout.
  3. Flush Valve: Exposed (top spud).
  4. Flush Operation: Sensor operated.
  5. Trap: Integral.
  6. Removable stainless steel strainer.
  7. Supply Size: 3/4 inch (19 mm).
  8. Outlet Size: 2 inches (50 mm).
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
  2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
- C. Carriers:
1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

## 2.4 LAVATORIES

- A. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, 3 with drillings on 4 inch (100 mm) centers, front overflow, soap depression, seal of putty, calking, or concealed vinyl gasket.
- B. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
1. Spout Style: Standard.
  2. Power Supply: Battery, easily replaceable, alkaline or lithium, minimum 200,000 cycles.
    - a. Low battery indicator warning light at 30 days remaining life and continuous light a 2 weeks.
  3. Mixing Valve: Internal, automatic.
  4. Aerator: Vandal resistant, 0.5 GPM (1.89 LPM), laminar flow device.
  5. Finish: Polished chrome.
  6. Accessory: 4 inch (102 mm) deck plate.
- C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- D. Accessories:
1. Chrome plated 17 gage, 0.0538 inch (1.37 mm) brass P-trap with clean-out plug and arm with escutcheon.
  2. Wheel handle stops.
  3. Rigid supplies.

## 2.5 SINKS

A. Single Compartment Bowl: ASME A112.19.3; 30" by 22" by 5.5" outside dimensions 18 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

1. Drain: 1-1/2 inch (38 mm) chromed brass drain.

## 2.6 ELECTRIC WATER COOLERS

A. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, stainless steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.

1. Capacity: 8 gallons per minute (30.3 liters per minute) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.
2. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

## 2.7 SERVICE SINKS

A. Bowl: 24 by 24 by 10 inch (600 by 600 by 250 mm) high white molded stone, floor mounted, with one inch (25 mm) wide shoulders, vinyl bumper guard, stainless steel strainer.

B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

C. Accessories:

1. 5 feet (1.5 m) of 1/2 inch (13 mm) diameter plain end reinforced rubber hose.
2. Hose clamp hanger.
3. Mop hanger.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### 3.2 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### 3.3 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.

- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 9005, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

#### 3.4 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

#### 3.5 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

#### 3.6 CLEANING

- A. Clean plumbing fixtures and equipment.

#### 3.7 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

#### 3.8 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches (380 mm) to top of bowl rim.
    - b. Accessible: 18 inches (455 mm) to top of seat.
  - 2. Lavatory:
    - a. Standard: 31 inches (785 mm) to top of basin rim.
    - b. Accessible: 34 inches (865 mm) to top of basin rim.
  - 3. Drinking Fountain:
    - a. Standard Adult: 40 inches (1015 mm) to top of basin rim.
    - b. Accessible: 36 inches (915 mm) to top of spout.

END OF SECTION



## SECTION 23 0130.51 - HVAC AIR-DISTRIBUTION SYSTEM CLEANING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Cleaning of HVAC duct system, equipment, and related components.

#### 1.2 DEFINITIONS

- A. HVAC System: For purposes of this section, the surfaces to be cleaned include all interior surfaces of the heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system, including the inside of air distribution equipment, coils, and condensate drain pans; see NADCA ACR for more details.

- 1. Above-ceiling plenum for return air is not required to be cleaned.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
- C. Qualifications Statement: Submit qualifications of proposed cleaning contractor for approval.
- D. Material Safety Data Sheets (MSDS): For all chemical products proposed to be used in the cleaning process; submit directly to Owner.
- E. Project Closeout Report: Include field quality control reports, evidence of satisfactory cleaning, and documentation of items needing further repair.

#### 1.4 QUALITY ASSURANCE

- A. Cleaning Contractor Qualifications: Company specializing in the cleaning and restoration of HVAC systems as specified in this section.
  - 1. Certified by one of the following:
    - a. NADCA, National Air Duct Cleaners Association: [www.nadca.com](http://www.nadca.com)
    - b. Nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
  - 2. Having minimum of three years documented experience.
  - 3. Employing for this project a supervisor certified by same organization that certified the cleaning contractor.

### PART 2 PRODUCTS

#### 2.1 TOOLS AND EQUIPMENT

- A. Vacuum Devices and Other Tools: Exceptionally clean, in good working order, and sealed when brought into the facility.
- B. Vacuum Devices That Exhaust Air Inside Building, Including Hand-Held and Wet Vacuums: Equipped with HEPA filtration with 99.97 percent collection efficiency for minimum 0.3-micron size particles and DOP test number.

HVAC Air-Distribution System Cleaning	12813	23 0130.51 4
--	-------	--------------

- C. Vacuum Devices That Exhaust Air Outside Building, Including Truck- and Trailer-Mounted Types: Equipped with particulate collection including adequate filtration to contain debris removed from the HVAC system; exhausted in manner that prevents contaminant re-entry to building; compliant with applicable regulations as to outdoor environmental contamination.

## 2.2 SURFACE TREATMENTS

- A. Anti-Microbial Materials: EPA registered specifically for use on non-porous HVAC system surfaces and applied per manufacturer's instructions.

## PART 3 EXECUTION

### 3.1 PROJECT CONDITIONS

- A. Comply with applicable federal, state, and local requirements.
- B. Perform cleaning, inspection, and remediation in accordance with the recommendations of NADCA "Assessment, Cleaning and Restoration of HVAC Systems" (ACR) and as specified herein.
- C. Where NADCA ACR uses the terms "recommended", "highly recommended", or "ideally" in regard to a certain procedure or activity, do that unless it is clearly inapplicable to the project.
- D. Obtain Owner's approval of proposed temporary locations for large equipment.
- E. Designate a decontamination area and obtain Owner's approval.
- F. If unforeseen mold or other biological contamination is encountered, notify Architect immediately, identifying areas affected and extent and type of contamination.

### 3.2 EXAMINATION

- A. Inspect the system as required to determine appropriate methods, tools, equipment, and protection.
- B. Start of cleaning work constitutes acceptance of existing conditions.
- C. When concealed spaces are later made accessible, examine and document interior conditions prior to beginning cleaning.

### 3.3 PREPARATION

- A. When cleaning work might adversely affect life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.
- B. Ensure that electrical components that might be adversely affected by cleaning are de-energized, locked out, and protected prior to beginning work.
- C. Air-Volume Control Devices: Mark the original position of dampers and other air-directional mechanical devices inside the HVAC system prior to starting cleaning.
- D. Access to Concealed Spaces: Use existing service openings and make additional service openings as required to accomplish cleaning and inspection.

HVAC Air-Distribution System Cleaning	12813	23 0130.51 4
--	-------	--------------



1. Do not cut openings in non-HVAC components without obtaining the prior approval of Owner.
  2. Make new openings in HVAC components in accordance with NADCA Standard 05; do not compromise the structural integrity of the system.
  3. Do not cut service openings into flexible duct; disconnect at ends for cleaning and inspection.
- E. Ceiling Tile: Lay-in ceiling tile may be removed to gain access to HVAC systems during the cleaning process; protect tile from damage and reinstall upon completion; replace damaged tile.

### 3.4 CLEANING

- A. Use any cleaning method recommended by NADCA ACR unless otherwise specified; do not use methods prohibited by NADCA ACR, or that will damage HVAC components or other work, or that will significantly alter the integrity of the system.
- B. Obtain Owner's approval before using wet cleaning methods; ensure that drainage is adequate before beginning.
- C. Ducts: Mechanically clean all portions of existing ducts to remain in the tenant space. Only the existing ductwork that remains in the affected tenant space is required to be cleaned. Existing interior ductwork that continues outside the tenant space, but is part of the same VAV air handler system is not required to be cleaned.
- D. Hoses, Cables, and Extension Rods: Clean using suitable sanitary damp wipes at the time they are being removed or withdrawn from their normal position.
- E. Coils: Follow NADCA ACR completely including measuring static pressure drop before and after cleaning; do not remove refrigeration coils from system to clean; report coils that are permanently impacted.
- F. Collect debris removed during cleaning; ensure that debris is not dispersed outside the HVAC system during the cleaning process.
- G. Store contaminated tools and equipment in polyethylene bags until cleaned in the designated decontamination area.

### 3.5 REPAIR

- A. Repair openings cut in the ventilation system so that they do not significantly alter the airflow or adversely impact the facility's indoor air quality.
- B. At insulated ducts and components, accomplish repairs in such a manner as to achieve the equivalent thermal value.
- C. Reseal new openings in accordance with NADCA Standard 05.
- D. Reseal rigid fiber glass duct systems using closure techniques that comply with UL 181 or UL 181A.
- E. When new openings are intended to be capable of being re-opened in the future, clearly mark them and report their locations to Owner in project report documents.

### 3.6 FIELD QUALITY CONTROL

HVAC Air-Distribution System Cleaning	12813	23 0130.51 4
--	-------	--------------

- A. Ensure that the following field quality control activities are completed prior to application of any treatments or coatings and prior to returning HVAC system to normal operation.
- B. Visually inspect all portions of the cleaned components; if not visibly clean as defined in NADCA ACR, re-clean and reinspect.
- C. Coils: Cleaning must restore the coil pressure drop to within 10 percent of the coil's original installed pressure drop; if original pressure drop is not known, coil will be considered clean if free of foreign matter and chemical residue based on visual inspection.
- D. Notify Architect when cleaned components are ready for inspection.
- E. When directed, re-clean components until they pass.
- F. Submit evidence that all portions of the system required to be cleaned have been cleaned satisfactorily.

### 3.7 ANTI-MICROBIAL TREATMENT

- A. When directed, apply anti-microbial treatment to internal surfaces.
- B. Apply anti-microbial agent after removal of surface deposits and debris.
- C. Apply anti-microbial treatments and coatings in strict accordance with the manufacturer's written recommendations and EPA registration listing.
- D. Spray coatings directly onto interior ductwork surfaces; do not "fog" into air stream.

### 3.8 ADJUSTING

- A. After satisfactory completion of field quality control activities, restore adjustable devices to original settings, including, but not limited to, dampers, air directional devices, valves, fuses, and circuit breakers.

### 3.9 WASTE MANAGEMENT

- A. Double-bag waste and debris in 6 mil, 0.006 inch (0.1524 mm) thick polyethylene plastic bags.
- B. Dispose of debris off-site in accordance with applicable federal, state and local requirements.

END OF SECTION

HVAC Air-Distribution System Cleaning	12813	23 0130.51 4
--	-------	--------------

## SECTION 23 0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Pipe sleeves.

#### 1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 0523 - General-Duty Valves for HVAC Piping.
- C. Section 23 0553 - Identification for HVAC Piping and Equipment: Piping identification.
- D. Section 23 0719 - HVAC Piping Insulation.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

### PART 2 PRODUCTS

#### 2.1 PIPE SLEEVES

- A. Sheet Metal or Schedule 40 steel: Pipe passing through interior walls, partitions, and floors, unless brass sleeves are specified below.
- B. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Partitions and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating walls and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Aboveground Piping:
    - a. Pack solid using mineral fiber in compliance with ASTM C592.

- b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
  - 2. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

Sleeves and Sleeve Seals for HVAC Piping	12813	23 0517 2
--	-------	-----------

## SECTION 23 0523 - GENERAL-DUTY VALVES FOR HVAC PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Angle valves.
- D. Globe valves.
- E. Ball valves.
- F. Gate valves.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

#### 1.3 REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch) 2013 (Reaffirmed 2018).
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- C. ASME B31.9 - Building Services Piping 2017.
- D. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.
- E. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves 2013.
- F. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors in dry environment.

### PART 2 PRODUCTS

#### 2.1 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:

General-Duty Valves for HVAC Piping	12813	23 0523 4
-------------------------------------	-------	-----------

1. Throttling (Hydronic): Globe and Angle.
  2. Isolation (Shutoff): Gate and Ball.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Heating Hot Water Valves:
1. 2 NPS (50 DN) and Smaller, Brass and Bronze Valves:
    - a. Threaded or soldered ends.
    - b. Angle: Bronze disc, Class 125.
    - c. Ball: Full port, three piece, stainless steel trim.
    - d. Gate: NRS, Class 125.
    - e. Globe: Bronze disc, Class 125.

## 2.2 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
1. Handwheel: Valves other than quarter-turn types.
  2. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller.
- D. Valves in Insulated Piping: Provide 2 NPS (50 DN) stem extensions and the following features:
1. Gate Valves: Rising stem.
  2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
  2. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
1. Building Services Piping Valves: ASME B31.9.

## 2.3 BRONZE ANGLE VALVES

- A. Class 125: CWP Rating: 200 psig: (1380 kPa) and Class 150: CWP Rating: 300 psig: (2070 kPa).
1. Comply with MSS SP-80, Type 1.
  2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
  3. Ends: Threaded.
  4. Stem: Bronze.

General-Duty Valves for HVAC Piping	12813	23 0523 4
-------------------------------------	-------	-----------

5. Disc: Bronze, PTFE or TFE.
6. Packing: Asbestos free.
7. Handwheel: Malleable iron or aluminum.

#### 2.4 BRONZE GLOBE VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa).
  1. Comply with MSS SP-80, Type 1.
  2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
  3. Ends: Threaded or solder joint.
  4. Stem and Disc: Bronze, PTFE or [\_\_\_\_].
  5. Packing: Asbestos free.
    - a. Handwheel: Malleable iron or aluminum.

#### 2.5 BRONZE BALL VALVES

- A. Three Piece, Full Port with Stainless Steel Trim:
  1. Comply with MSS SP-110.
  2. SWP Rating: 150 psig (1035 kPa).
  3. CWP Rating: 600 psig (4140 kPa).
  4. Body: Bronze.
  5. Ends: Threaded.
  6. Seats: PTFE.
  7. Stem: Stainless steel.
  8. Ball: Stainless steel, vented.

#### 2.6 BRONZE GATE VALVES

- A. Non-Rising Stem (NRS) or Rising Stem (RS):
  1. Comply with MSS SP-80, Type I.
  2. Body Material: Bronze with integral seat and union-ring bonnet.
  3. Ends: Threaded or solder joint.
  4. Stem: Bronze.
  5. Disc: Solid wedge; bronze.
  6. Packing: Asbestos free.
  7. Handwheel: Malleable iron, bronze, or aluminum.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

General-Duty Valves for HVAC Piping	12813	23 0523 4
-------------------------------------	-------	-----------

- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Should valve be determined to be defective, replace with new valve.

3.2 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION

General-Duty Valves for HVAC Piping	12813	23 0523 4
-------------------------------------	-------	-----------



## SECTION 23 0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

#### 1.2 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- F. MFMA-4 - Metal Framing Standards Publication 2004.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems.

### PART 2 PRODUCTS

#### 2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of HVAC work.

Hangers and Supports for HVAC Piping and Equipment	12813	23 0529 4
--	-------	-----------

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
  4. Do not use wire, chain, perforated pipe strap or wood for permanent supports unless specifically indicated or permitted.
  5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
  2. Comply with MFMA-4.
  3. Channel Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  4. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
  5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch (13 mm) diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.
- D. Pipe Supports:

Hangers and Supports for HVAC Piping and Equipment	12813	23 0529 4
--	-------	-----------

1. Operating Temperatures from 122 to 446 degrees F (50 to 230 degrees C):
  - a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.
  - b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.
  - c. Sliding Support: MSS SP-58 Types 35 through 38.
- E. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
  1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
  2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- F. Strut Clamps: Two-piece pipe clamp.
- G. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- H. Anchors and Fasteners:
  1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  3. Hollow Stud Walls: Use toggle bolts.
  4. Steel: Use beam clamps, machine bolts or welded threaded studs.
  5. Sheet Metal: Use sheet metal screws.
  6. Plastic and lead anchors are not permitted.
  7. Powder-actuated fasteners are not permitted.
  8. Hammer-driven anchors and fasteners are not permitted.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
  1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.

Hangers and Supports for HVAC Piping and Equipment	12813	23 0529 4
--	-------	-----------

2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

END OF SECTION

Hangers and Supports for HVAC Piping and Equipment	12813	23 0529 4
--	-------	-----------

## SECTION 23 0548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Vibration isolators.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

#### 1.3 REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications Most Recent Edition Cited by Referring Code or Reference Standard.
- B. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
  - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification method for spring element load capacities.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.1 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
  - 1. Select vibration isolators to provide required static deflection.
  - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
- D. Equipment Isolation:
  - 1. Equipment Type: VAV terminals.
    - a. Location: Indoor.
    - b. Mounting: Suspended from building structure.

Vibration and Seismic Controls for HVAC	12813	23 0548 3
---	-------	-----------

- c. Isolator Type (Non-Seismic Application): Combination resilient material/spring isolator hangers.

E. Piping Isolation:

1. Provide vibration isolators for piping supports:
  - a. Located in equipment rooms.
  - b. Located within 50 feet (15.2 m) of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
2. Suspended Piping, Non-Seismic Applications: Use resilient material isolator hangers, spring isolator hangers or combination resilient material/spring isolator hangers.

## 2.2 VIBRATION ISOLATORS

A. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
  - a. Color code or otherwise identify springs to indicate load capacity.
  - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
  - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
  - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
  - e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
  - f. Selected to function without undue stress or overloading.

B. Vibration Isolators for Non-Seismic Applications:

1. Resilient Material Isolator Mounts, Non-Seismic:
  - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g. neoprene, rubber) or fiberglass isolator material; fail-safe type.
2. Spring Isolator Hangers, Non-Seismic:
  - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
  - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short circuiting of isolation.
3. Combination Resilient Material/Spring Isolator Hangers, Non-Seismic:

Vibration and Seismic Controls for HVAC	12813	23 0548 3
---	-------	-----------

- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g. neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
- b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short circuiting of isolation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- E. Vibration Isolation Systems:
  - 1. Isolator Hangers:
    - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
    - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
  - 2. Clean debris from beneath vibration-isolated equipment that could cause short circuiting of isolation.
  - 3. Use elastomeric grommets for attachments where required to prevent short circuiting of isolation.
  - 4. Adjust isolators to be free of isolation short circuits during normal operation.
  - 5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

END OF SECTION

Vibration and Seismic Controls for HVAC	12813	23 0548 3
---	-------	-----------





## SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Nameplates.
- B. Pipe markers.
- C. Ceiling tacks.

#### 1.2 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.

### PART 2 PRODUCTS

#### 2.1 IDENTIFICATION APPLICATIONS

- A. Air Terminal Units: Nameplates and ceiling tacks where located above lay-in ceiling.
- B. Piping: Pipe markers.
- C. Thermostats: Nameplates.

#### 2.2 NAMEPLATES

- A. Letter Color: Black.
- B. Letter Height: 1/2 inch (13 mm).
- C. Background Color: White.
- D. Plastic: Comply with ASTM D709.

#### 2.3 PIPE MARKERS

- A. Manufacturers:
  - 1. Brady Corporation; [\_\_\_\_]: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  - 2. Brimar Industries, Inc; [\_\_\_\_]: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 3. MIFAB, Inc; [\_\_\_\_]: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  - 4. Seton Identification Products, a Tricor Company; [\_\_\_\_]: [www.seton.com/#sle](http://www.seton.com/#sle).
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

#### 2.4 CEILING TACKS

Identification for HVAC Piping and Equipment	12813	23 0553 2
--	-------	-----------

- A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.

### PART 3 EXECUTION

#### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

#### 3.2 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install plastic pipe markers in accordance with manufacturer's instructions.
- C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- D. Locate ceiling tacks to locate valves or VAV terminals above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Identification for HVAC Piping and Equipment	12813	23 0553 2
--	-------	-----------

## SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.

#### 1.2 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008 (Reaffirmed 2017).
- C. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing 2002.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Architect.
  - 2. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - d. Final test report forms to be used.
    - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.

Testing, Adjusting, and Balancing for HVAC	12813	23 0593 7
--	-------	-----------

3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
  1. AABC (NSTSB), AABC National Standards for Total System Balance.
  2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
  1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. TABBB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  4. Duct systems are clean of debris.

Testing, Adjusting, and Balancing for HVAC	12813	23 0593 7
--	-------	-----------

5. Fans are rotating correctly.
  6. Fire and volume dampers are in place and open.
  7. Air outlets are installed and connected.
  8. Duct system leakage is minimized.
  9. Hydronic systems are flushed, filled, and vented.
  10. Pumps are rotating correctly.
  11. Proper strainer baskets are clean and in place.
  12. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

### 3.3 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

### 3.4 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

### 3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

Testing, Adjusting, and Balancing for HVAC	12813	23 0593 7
---	-------	-----------

- F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- I. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- J. For variable air volume system units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

### 3.6 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Effect system balance with automatic control valves fully open to heat transfer elements.
- D. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- E. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

### 3.7 SCOPE

- A. Test, adjust, and balance the following:
  - 1. HVAC heating hot water zone Pumps.
  - 2. Air Handling Units.
  - 3. Fans.
  - 4. Air Terminal Units.
  - 5. Air Inlets and Outlets.

### 3.8 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
  - 1. Manufacturer.
  - 2. Model/Frame.
  - 3. HP/BHP.

Testing, Adjusting, and Balancing for HVAC	12813	23 0593 7
--	-------	-----------

4. Phase, voltage, amperage; nameplate, actual, no load.
  5. RPM.
  6. Service factor.
  7. Sheave Make/Size/Bore.
- B. V-Belt Drives:
1. Identification/location.
  2. Required driven RPM.
  3. Driven sheave, diameter and RPM.
  4. Motor sheave diameter and RPM.
- C. Pumps:
1. Identification/number.
  2. Manufacturer.
  3. Size/model.
  4. Impeller.
  5. Service.
  6. Design flow rate, pressure drop, BHP.
  7. Actual flow rate, pressure drop, BHP.
  8. Discharge pressure.
  9. Suction pressure.
  10. Total operating head pressure.
- D. Cooling Coils:
1. Identification/number.
  2. Location.
  3. Service.
  4. Manufacturer.
  5. Air flow, design and actual.
  6. Entering air DB temperature, design and actual.
  7. Entering air WB temperature, design and actual.
  8. Leaving air DB temperature, design and actual.
  9. Leaving air WB temperature, design and actual.
  10. Air pressure drop, design and actual.
- E. Heating Coils:
1. Identification/number.
  2. Location.
  3. Service.

4. Manufacturer.
  5. Air flow, design and actual.
  6. Water flow, design and actual.
  7. Water pressure drop, design and actual.
  8. Entering water temperature, design and actual.
  9. Leaving water temperature, design and actual.
  10. Entering air temperature, design and actual.
  11. Leaving air temperature, design and actual.
- F. Air Moving Equipment:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Arrangement/Class/Discharge.
  5. Air flow, specified and actual.
  6. Return air flow, specified and actual.
  7. Outside air flow, specified and actual.
  8. Total static pressure (total external), specified and actual.
  9. Inlet pressure.
  10. Discharge pressure.
  11. Sheave Make/Size/Bore.
  12. Fan RPM.
- G. Exhaust Fans:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Air flow, specified and actual.
  5. Total static pressure (total external), specified and actual.
  6. Inlet pressure.
  7. Discharge pressure.
  8. Sheave Make/Size/Bore.
  9. Fan RPM.
- H. Duct Traverses:
1. System zone/branch.
  2. Duct size.
  3. Area.



4. Design velocity.
  5. Design air flow.
  6. Test velocity.
  7. Test air flow.
  8. Duct static pressure.
- I. Terminal Unit Data:
1. Manufacturer.
  2. Type, constant, variable, single, dual duct.
  3. Identification/number.
  4. Location.
  5. Model number.
  6. Size.
  7. Minimum static pressure.
  8. Minimum design air flow.
  9. Maximum design air flow.
  10. Maximum actual air flow.
  11. Inlet static pressure.
- J. Air Distribution Tests:
1. Air terminal number.
  2. Room number/location.
  3. Terminal type.
  4. Terminal size.
  5. Design velocity.
  6. Design air flow.
  7. Test (final) velocity.
  8. Test (final) air flow.
  9. Percent of design air flow.

END OF SECTION

Testing, Adjusting, and Balancing for HVAC	12813	23 0593 7
---	-------	-----------



## SECTION 23 0713 - DUCT INSULATION

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Duct insulation.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0553 - Identification for HVAC Piping and Equipment.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

### PART 2 PRODUCTS

#### 2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### 2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
  - 1. CertainTeed Corporation; [\_\_\_\_]: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Johns Manville; [\_\_\_\_]: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 3. Knauf Insulation; Atmosphere Duct Wrap: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 4. Owens Corning Corporation; [\_\_\_\_]: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
- D. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Barrier Mastic:
  - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, white color.

#### 2.3 GLASS FIBER, RIGID

- A. Manufacturer:

Duct Insulation	12813	23 0713 2
-----------------	-------	-----------

1. CertainTeed Corporation; [\_\_\_\_\_]: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  2. Johns Manville; [\_\_\_\_\_]: [www.jm.com/#sle](http://www.jm.com/#sle).
  3. Knauf Insulation; [\_\_\_\_\_]: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  4. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
1. K (Ksi) Value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C518.
  2. Maximum Service Temperature: 450 degrees F (232 degrees C).
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd (305 g/sq m) weight, glass fabric.
  2. Vinyl emulsion type acrylic, compatible with insulation, white color.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
  2. Finish with tape and vapor barrier jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

### 3.2 SCHEDULES

- A. Supply Ducts: sufficient thickness to meet 2015 VECC, generally R-6.0 minimum.

END OF SECTION

## SECTION 23 0719 - HVAC PIPING INSULATION

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.
- C. Section 23 2300 - Refrigerant Piping: Placement of inserts.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

### PART 2 PRODUCTS

#### 2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### 2.2 GLASS FIBER, RIGID

- A. Manufacturers:
  - 1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
  - 2. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
  - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: [www.knaufinsulation.com/#sle](http://www.knaufinsulation.com/#sle).
  - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
  - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

#### 2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
  - 1. Aeroflex USA, Inc; Aerocel ULP: [www.aeroflexusa.com/#sle](http://www.aeroflexusa.com/#sle).
  - 2. Armacell LLC; AP Armaflex: [www.armacell.us/#sle](http://www.armacell.us/#sle).
  - 3. K-Flex USA LLC; K-Flex Titan: [www.kflexusa.com/#sle](http://www.kflexusa.com/#sle).

- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - 1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
  - 2. Maximum Service Temperature: 180 degrees F (82 degrees C).
  - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

## 2.4 JACKETS

- A. PVC Plastic.
  - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F (minus 18 degrees C).
    - b. Maximum Service Temperature: 150 degrees F (66 degrees C).
    - c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil (0.25 mm).
    - e. Connections: Brush on welding adhesive.
  - 2. Covering Adhesive Mastic: Compatible with insulation.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- C. Glass fiber insulated pipes conveying fluids above ambient temperature.
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- D. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under the finish jacket.
  - 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.

- E. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

### 3.3 SCHEDULE

#### A. Heating Systems:

- 1. Heating Water Supply and Return: Rigid Fiberglass, 2" thick

#### B. Cooling Systems:

- 1. Refrigerant Suction: Elastomeric, 1" thick
- 2. Refrigerant Hot Gas: Elastomeric, 1" thick

END OF SECTION





## SECTION 23 0993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
  - 1. Air terminal units.
  - 2. Central fan systems.
  - 3. Refrigeration systems.

#### 1.2 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
- D. Points List: Submit list of all control points indicating at least the following for each point.
  - 1. Name of controlled system.
  - 2. Point description; such as dry bulb temperature, airflow, etc.
  - 3. Control point or setpoint (Yes / No); i.e. a point that controls equipment and can have its setpoint changed.
  - 4. Monitoring point (Yes / No); i.e. a point that does not control or contribute to the control of equipment but is used for operation, maintenance, or performance verification.

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION

#### 3.1 AIR TERMINAL UNITS

- A. Single-duct Variable Volume:
  - 1. Cooling with Reheat:
    - a. On a rise in space temperature above the cooling set-point, the unit primary airflow modulates from the cooling minimum airflow to the cooling maximum airflow.
    - b. As the space temperature falls below the cooling set-point, the unit primary airflow modulates to its minimum cooling airflow.

Sequence of Operations for HVAC Controls	12813	23 0993 2
--	-------	-----------

- c. As the space temperature continues to fall below the heating set-point, the terminal modulates to its heating minimum airflow. At this point, the hot water reheat valve will open to allow flow through the heating coil.

### 3.2 CENTRAL FAN SYSTEMS

- A. Time Schedule: Start and stop supply fan. Determine fan status by current sensing devices. If fan fails to start as commanded, signal alarm.
- B. Safety Devices:
  - 1. Freeze Protection: Stop fans and close outside air dampers if temperature downstream of heating coil is below 37 degrees F (3 degrees C); signal alarm.
  - 2. Smoke Detector: Stop fans, close outside dampers, and close smoke dampers if smoke is detected; signal alarm.
- C. Outside Air Damper: When supply fan is running, open outside air damper to minimum position.
- D. Outside, Return, and Relief Dampers:
  - 1. When supply fan is not running, outside and relief dampers are closed and return damper is open.
  - 2. When supply fan is running, dampers are controlled and operate with outside and relief dampers opening, and return damper closing.
  - 3. For cooling and outside air temperatures below 55 degrees F (12 degrees C), modulate dampers to maintain supply air temperature of 55 degrees F (12 degrees C) and employ supply air reset schedule to a maximum of 60 degrees F..
  - 4. For cooling and outside air temperatures above 55 degrees F (12 degrees C) compare return and outside air temperatures. If return air temperature is lower, drive outside damper to minimum, close relief damper, and open return damper.
  - 5. For heating, drive outside damper to minimum, close relief damper, and open return damper.

### 3.3 REFRIGERATION SYSTEMS

- A. Maintain constant supply air duct temperature of 55 degrees F (13 degrees C) by cycling refrigeration system and signalling step capacity, minimum of 4 steps.
- B. Employ supply air reset strategy to increase the target supply air temperature up to a maximum of 60 degrees F when ambient outdoor temperature is 60 degrees F or below.

END OF SECTION

Sequence of Operations for HVAC Controls	12813	23 0993 2
--	-------	-----------

## SECTION 23 2113 - HYDRONIC PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Heating water and glycol piping, above grade.
- D. Pipe hangers and supports.
- E. Unions, flanges, mechanical couplings, and dielectric connections.
- F. Valves:
  - 1. Ball valves.
- G. Flow controls.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0523 - General-Duty Valves for HVAC Piping.
- B. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- C. Section 23 0553 - Identification for HVAC Piping and Equipment.
- D. Section 23 0719 - HVAC Piping Insulation.

#### 1.3 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- C. ASME B31.9 - Building Services Piping 2017.
- D. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- E. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2016.
- F. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2018.
- G. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2011 (Amended 2012).
- H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
  - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
  - 2. Provide manufacturers catalogue information.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

- B. 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

### 2.1 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
  - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
  - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
  - 3. Grooved mechanical joints may be used in accessible locations only.
    - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
    - b. Use rigid joints unless otherwise indicated.
  - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
  - 1. Isolate equipment using ball valves with threaded connections.
  - 2. For shut-off and to isolate parts of systems or vertical risers, use gate, ball or butterfly valves.

### 2.2 HEATING WATER AND GLYCOL PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:
  - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
    - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
    - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
  - 2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

### 2.3 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Carbon steel, adjustable swivel, split ring.
3. Hangers for Hot Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

## 2.4 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2.5 Inches and Less:
  1. Copper Pipe: Bronze, soldered joints.
- B. Flanges for Pipe 3 Inches and Greater:
  1. Copper Piping: Bronze.

## 2.5 FLOW CONTROLS

- A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi (13.7 kPa).

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install heating water piping to ASME B31.9 requirements.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls and floors.
- G. Pipe Hangers and Supports:
  1. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
  2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
  3. Use hangers with 1-1/2 inch (38 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  6. Provide copper plated hangers and supports for copper piping.
- H. Install valves with stems upright or horizontal, not inverted.

## 3.2 SCHEDULES

### A. Hanger Spacing for Copper Tubing.

1. 1/2 inch (15 mm) and 3/4 inch (20 mm): Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6 mm).
2. 1 inch (25 mm): Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6 mm).
3. 1-1/2 inch (40 mm) and 2 inch (50 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 3/8 inch (9 mm).
4. 2-1/2 inch (65 mm): Maximum span, 9 feet (2700 mm); minimum rod size, 3/8 inch (9 mm).
5. 3 inch (80 mm): Maximum span, 10 feet (3.0 m); minimum rod size, 3/8 inch (9 mm).

END OF SECTION

## SECTION 23 2300 - REFRIGERANT PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Filter-driers.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0719 - HVAC Piping Insulation.

#### 1.3 REFERENCE STANDARDS

- A. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants 2019.
- B. ASME B31.5 - Refrigeration Piping and Heat Transfer Components 2016.
- C. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2016.
- D. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.

#### 1.4 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. Liquid Indicators:
  - 1. Use line size liquid indicators in main liquid line leaving condenser.
- C. Valves:
  - 1. Use service valves on suction and discharge of compressors.
- D. Filter-Driers:
  - 1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
  - 2. Use a filter-drier on suction line just ahead of compressor.
  - 3. Use sealed filter-driers in lines smaller than 1/2 inch (13 mm) outside diameter.

### PART 2 PRODUCTS

#### 2.1 PIPING

#### 2.2 REFRIGERANT

#### 2.3 MOISTURE AND LIQUID INDICATORS

- A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

## 2.4 VALVES

### A. Service Valves:

- 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi (3450 kPa).

## 2.5 FILTER-DRIERS

### A. Performance:

- 1. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
- 2. Design Working Pressure: 350 psi (2410 kPa), minimum.

- B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

### C. Construction: UL listed.

- 1. Sealed Type: Copper shell.
- 2. Connections: As specified for applicable pipe type.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.5.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches (300 mm) of each horizontal elbow.

### 3.2 SCHEDULES

#### A. Hanger Spacing for Copper Tubing.

- 1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).



END OF SECTION

Refrigerant Piping	12813	23 2300 3
--------------------	-------	-----------



## SECTION 23 2500 - HVAC WATER TREATMENT

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Materials.
  - 1. System cleaner.
  - 2. Closed system treatment (water).
- B. By-pass (pot) feeder.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. System Cleaner:
  - 1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.
- B. Closed System Treatment (Water):
  - 1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.

#### 2.2 BY-PASS (POT) FEEDER

- A. This facility has an existing, never installed, pot feeder with floor stand located in the boiler room. It should be installed/connected to the existing hot water piping system with 3/4" Type L copper piping and ball isolation valves to the suction and discharge manifolds of the zone hot water pumps. The new piping and connection points at existing manifolds should be insulated. See HVAC Piping Insulation section for insulation specifications. Obtain Owner approval for location of the pot feeder in the boiler room.

### PART 3 EXECUTION

#### 3.1 PREPARATION

- A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.
- B. Place terminal control valves in open position during cleaning.
- C. Verify that electric power is available and of the correct characteristics.

#### 3.2 CLEANING SEQUENCE

- A. Concentration:
  - 1. As recommended by cleaning agent manufacturer.
- B. Hot Water Heating Systems:
  - 1. Apply heat while circulating, slowly raising temperature to 160 degrees F (71 degrees C) and maintain for 12 hours minimum.

2. Remove heat and circulate to 100 degrees F (37.8 degrees C) or less; drain systems as quickly as possible and refill with clean water.
3. Circulate for 6 hours at design temperatures, then drain.
4. Refill with clean water and repeat until system cleaner is removed.

### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

### 3.4 CLOSED SYSTEM TREATMENT

- A. Utilize existing bypass feeder (by Owner) on the hot water heating system after installation. Install isolating and drain valves and necessary piping.
- B. Introduce closed system treatment through bypass feeder when required or indicated by test.

### 3.5 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's personnel on operation and maintenance of chemical treatment system.
  1. Provide minimum of two hours of instruction for two people.
  2. Have operation and maintenance data prepared and available for review during training.
  3. Conduct training using actual equipment after treated system has been put into full operation.

END OF SECTION

## SECTION 23 3100 - HVAC DUCTS AND CASINGS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Metal ductwork.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- C. Section 23 3300 - Air Duct Accessories.
- D. Section 23 3600 - Air Terminal Units.
- E. Section 23 3700 - Air Outlets and Inlets.

#### 1.3 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2019a.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- D. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

#### 1.4 FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

### PART 2 PRODUCTS

#### 2.1 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (System with Cooling Coils): 2 inch w.g. (500 Pa) pressure class, galvanized steel.
- D. Medium and High Pressure Supply: 4 inch pressure class, galvanized steel.
- E. Return and Relief: 1 inch w.g. (250 Pa) pressure class, galvanized steel.
- F. General Exhaust: 1 inch w.g. (250 Pa) pressure class, galvanized steel.

#### 2.2 MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

## 2.3 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Construct Tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

## 2.4 MANUFACTURED DUCTWORK AND FITTINGS

- A. Round Ducts: Round lockseam duct with galvanized steel outer wall.
  - 1. Manufacture in accordance with SMACNA (DCS).
- B. Flexible Ducts: UL 181, Class 0, interlocking spiral of aluminum foil.
  - 1. Pressure Rating: 8 inches WG (2.0 kPa) positive or negative.
  - 2. Maximum Velocity: 5000 fpm (25.4 m/sec).
  - 3. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 99 degrees C).
- C. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
- D. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Flexible Ducts: Connect to metal ducts with liquid adhesive plus tape.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION

## SECTION 23 3300 - AIR DUCT ACCESSORIES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Backdraft dampers - metal.
- B. Duct access doors.
- C. Duct test holes.
- D. Fire dampers.
- E. Flexible duct connections.
- F. Volume control dampers.
- G. Miscellaneous products:
  - 1. Duct opening closure film.

#### 1.2 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).
- C. UL 33 - Safety Heat Responsive Links for Fire-Protection Service Current Edition, Including All Revisions.
- D. UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

### PART 2 PRODUCTS

#### 2.1 BACKDRAFT DAMPERS - METAL

- A. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

#### 2.2 BACKDRAFT DAMPERS - FABRIC

- A. Fabric Backdraft Dampers: Factory-fabricated.
  - 1. Blades: Neoprene coated fabric material.
  - 2. Birdscreen: 1/2 inch (12 mm) nominal mesh of galvanized steel or aluminum.
  - 3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

#### 2.3 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.

## 2.4 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

## 2.5 FIRE DAMPERS

- A. Manufacturers:
  - 1. Nailor Industries, Inc; [\_\_\_\_\_]: [www.nailor.com/#sle](http://www.nailor.com/#sle).
  - 2. NCA, a brand of Metal Industries Inc; [\_\_\_\_\_]: [www.ncamfg.com/#sle](http://www.ncamfg.com/#sle).
  - 3. Ruskin Company; [\_\_\_\_\_]: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch (250 Pa) pressure class ducts up to 12 inches (300 mm) in height.
- D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

## 2.6 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
  - 1. Carlisle HVAC Products; Dynair Connector Plus G90 Steel Offset Seam Neoprene Fabric: [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).
  - 2. Ductmate Industries, Inc, a DMI Company; [\_\_\_\_\_]: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
  - 3. Elgen Manufacturing, Inc; [\_\_\_\_\_]: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd (1.0 kg/sq m).
  - 2. Metal: 3 inches (75 mm) wide, 24 gage, 0.0239 inch (0.61 mm) thick galvanized steel.

## 2.7 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Single Blade Dampers:
  - 1. Fabricate for duct sizes up to 6 by 30 inch (150 by 760 mm).
  - 2. Blade: 24 gage, 0.0239 inch (0.61 mm), minimum.
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
  - 1. Blade: 18 gage, 0.0478 inch (1.21 mm), minimum.



- D. End Bearings: Except in round ducts 12 inches (300 mm) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.
- E. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
  - 3. Where rod lengths exceed 30 inches (750 mm) provide regulator at both ends.

## 2.8 MISCELLANEOUS PRODUCTS

- A. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
  - 1. Thickness: 2 mils (0.6 mm).
  - 2. High tack water based adhesive.
  - 3. UV stable light blue color.
  - 4. Elongation Before Break: 325 percent, minimum.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- E. Demonstrate re-setting of fire dampers to Owner's representative.
- F. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- G. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- H. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- I. Provide balancing dampers on high velocity systems where indicated. Refer to Section 23 3600 - Air Terminal Units.

- J. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

## SECTION 23 3600 - AIR TERMINAL UNITS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Single-duct terminal units.
  - 1. Single-duct, variable-volume units.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- B. Section 23 2113 - Hydronic Piping: Connections to heating coils.
- C. Section 23 3100 - HVAC Ducts and Casings.
- D. Section 23 3300 - Air Duct Accessories.
- E. Section 23 3700 - Air Outlets and Inlets.

#### 1.3 REFERENCE STANDARDS

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils 2001, with Addendum (2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals 2017.
- C. ASHRAE Std 130 - Methods of Testing Air Terminal Units 2016.
- D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material) 2019.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2019b.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- G. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems 2008.
- H. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors current edition, including all revisions.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate air flow, static pressure, and NC designation. Include electrical characteristics and connection requirements.

### PART 2 PRODUCTS

#### 2.1 SINGLE-DUCT, VARIABLE-VOLUME UNITS

- A. Manufacturers:
  - 1. Carrier, a part of UTC Building and Industrial Systems, a unit of United Technologies Corp.; [\_\_\_\_]: [www.commercial.carrier.com/#sle](http://www.commercial.carrier.com/#sle).
  - 2. Johnson Controls, Inc; [\_\_\_\_]: [www.johnsoncontrols.com/#sle](http://www.johnsoncontrols.com/#sle).

3. Krueger-HVAC; [\_\_\_\_]: [www.krueger-hvac.com/#sle](http://www.krueger-hvac.com/#sle).
4. Metalaire, a brand of Metal Industries Inc; [\_\_\_\_]: [www.metalaire.com/#sle](http://www.metalaire.com/#sle).
5. Price Industries, Inc; [\_\_\_\_]: [www.priceindustries.com/#sle](http://www.priceindustries.com/#sle).
6. Trane, a brand of Ingersoll Rand; [\_\_\_\_]: [www.trane.com/#sle](http://www.trane.com/#sle).

B. General:

1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

C. Unit Casing:

1. Minimum 22 gage, 0.0299 inch (0.76 mm) galvanized steel.
  - a. Casing leakage to meet ASHRAE Std 130.
2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, with slip-and-drive connections.
4. Acceptable Liners:
  - a. 1/2 inch (13 mm) thick, coated, fibrous-glass complying with ASTM C1071.
    - 1) Secure with adhesive.
    - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
    - 3) Cover liner with non-porous foil.
  - b. 3/4 inch (19 mm) thick polyurethane foam adhesive complying with UL 181 erosion requirements in accordance with ASHRAE Std 62.1, and having a maximum smoke developed index of 50 for both insulation and adhesive, when tested in accordance with ASTM E84.
  - c. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

D. Damper Assembly:

1. Heavy-gage, galvanized steel or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.
  - a. Air Leakage Past Closed Damper: Maximum two percent of unit maximum airflow at 3 inch wg (750 Pa) inlet static pressure, tested in accordance with ASHRAE Std 130.

E. Hot Water Heating Coil:

1. Coil Casing: Minimum 22 gage, 0.0299 inch (0.76 mm) galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
  2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
  3. Coil leak tested to minimum 350 psig (2413 kPa).
  4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.
- F. Controls:
1. DDC (Direct-Digital Controls):
    - a. Factory or field-mounted DDC controller compatible with facility existing DDC system.
      - 1) The unit level controller to include the following:
        - (a) 24 VAC power terminal or RJ-12 Power connection.
        - (b) T-Stat Port for thermostat connection.
        - (c) Service Port for diagnostic equipment.
        - (d) Damper actuator.
        - (e) LED indication for troubleshooting.
        - (f) Three binary staged heating outputs.
        - (g) Binary cooling output.
        - (h) S.A.T. sensor input.
        - (i) Contact closure input.
        - (j) Four analog outputs.
    - b. Include a factory-installed, unit-mounted or field-installed, factory-tested, direct-digital controller.
    - c. Bi-directional Damper Actuator: 24 volt, powered closed, spring return open.
    - d. Microprocessor-Based Controller: Air volume controller, pressure-independent with electronic airflow transducers, factory-calibrated maximum and minimum CFM's.
      - 1) Occupied and unoccupied operating mode.
      - 2) Remote reset of temperature or CFM set points.
      - 3) Proportional, plus integral control of room temperature.
      - 4) Monitoring and adjusting with portable terminal.
    - e. Room Sensor:
      - 1) Compatible with temperature controls specified.

- 2) Wall-mounted, system powered, with temperature set-point adjustment including connection access for portable operator terminal.

## 2.2 HOSE KITS AND VALVES

### A. Hoses:

1. Provide hoses for all units for connection to main water supply and return headers.
2. Length: 2 feet (0.61 m).
3. Material: Braided stainless steel rated to minimum 400 psi (3758 kPa) at 265 degrees F (129.4 degrees C).

### B. Ball Valves:

1. Brass body for shutoff and hydronic balancing.
2. Provide pressure/temperature ports.
3. Provide balancing valves.

### C. Y Strainers:

1. Bronze body.
2. "Y" type configuration with brass cap.
3. Maximum Operating Pressure: Minimum 450 psi (3103 kPa).
4. Screen: Stainless steel.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. Provide ceiling access doors or locate units above easily removable ceiling components.
- D. Support units individually from structure in accordance with SMACNA (SRM). See Section 23 0548.
- E. Do not support from ductwork.
- F. Connect to ductwork in accordance with Section 23 3100.

END OF SECTION

## SECTION 23 3700 - AIR OUTLETS AND INLETS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Diffusers:
  - 1. Rectangular ceiling diffusers.
- B. Registers/grilles:
  - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.

#### 1.2 REFERENCE STANDARDS

- A. AHRI 880 (I-P) - Performance Rating of Air Terminals 2017.
- B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

### PART 2 PRODUCTS

#### 2.1 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide square and rectangular, adjustable pattern diffuser to discharge air in four way pattern.
- B. Accessories: Provide radial opposed blade volume control damper; sectorizing baffle with damper adjustable from diffuser face.

#### 2.2 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch (13 by 13 by 13 mm) grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Color: As indicated.
- D. Frame: Channel lay-in frame for suspended grid ceilings.
- E. Accessories: Provide integral, gang & face operated opposed blade damper.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.

Air Outlets and Inlets	12813	23 3700 2
------------------------	-------	-----------

- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9123.

END OF SECTION



## SECTION 23 4000 - HVAC AIR CLEANING DEVICES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Disposable, extended area panel filters.

#### 1.2 REFERENCE STANDARDS

- A. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size 2017.
- B. UL 900 - Standard for Air Filter Units Current Edition, Including All Revisions.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.

### PART 2 PRODUCTS

#### 2.1 FILTER MANUFACTURERS

- A. Smith Filter Corporation: [www.smithfilter.com](http://www.smithfilter.com)
- B. AAF International/American Air Filter; [\_\_\_\_]: [www.aafintl.com/#sle](http://www.aafintl.com/#sle).
- C. The Camfil Group; [\_\_\_\_]: [www.camfilfarr.com/#sle](http://www.camfilfarr.com/#sle).

#### 2.2 DISPOSABLE, EXTENDED AREA PANEL FILTERS

- A. Manufacturers:
  - 1. Camfil AP-Eleven.
  - 2. AAF PREpleat M11 HC.
- B. Media: UL 900 Class 1, pleated, lofted, non-woven, reinforced cotton and synthetic fabric; supported and bonded to welded wire grid and beverage board frame.
  - 1. Frame: beverage board.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install air cleaning devices in accordance with manufacturer's instructions.
- B. Prevent passage of unfiltered air around filters with felt, rubber, or neoprene gaskets.
- C. Do not operate fan system until filters (temporary or permanent) are in place. The specified MERV 11 filters are required to be used during construction. Replace temporary filters used during construction and testing with clean set for Owner occupancy.

END OF SECTION



## SECTION 23 8126.13 - SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Air-source heat pumps.
- B. Air cooled condensing units.
- C. Indoor air handling (fan and coil) units for ductless systems.
- D. Controls.

#### 1.2 REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2008, Including All Addenda.
- B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units 2004.
- C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants 2019.
- D. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant 2019.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- F. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2018.
- G. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

#### 1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

#### 1.4 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturers warranty for compressors.

### PART 2 PRODUCTS

#### 2.1 SYSTEM DESIGN

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
  - 1. Heating: None.

Small-Capacity Split-System Air Conditioners	12813	23 8126.13 3
--	-------	--------------

2. Cooling: Outdoor electric condensing unit with evaporator coil in single ductless unit.
  3. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Drawings for additional requirements.
- C. Electrical Characteristics:
1. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 26 0583.

## 2.2 INDOOR AIR HANDLING UNITS FOR DUCTLESS SYSTEMS

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
1. Location: High-wall.
  2. Cabinet: Polymer.
    - a. Finish: White.
  3. Fan: Line-flow fan direct driven by a single motor.
  4. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
  2. Manufacturer: System manufacturer.
- C. Remote Actuators:

## 2.3 OUTDOOR UNITS

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Refrigerant: R-410A.
  2. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
  3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.
- B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
- C. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).

Small-Capacity Split-System Air Conditioners	12813	23 8126.13 3
--	-------	--------------

1. Provide thermostatic expansion valves.
  2. Provide locking caps for gauge ports.
- D. Operating Controls:
1. Control by room thermostat to maintain room temperature setting.

## 2.4 ACCESSORY EQUIPMENT

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
1. Automatic switching from heating to cooling.
  2. Preferential rate control to minimize overshoot and deviation from setpoint.
  3. Thermostat Display:
    - a. Actual room temperature.
    - b. Programmed temperature.
    - c. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, System Auto or On, Off.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

### 3.2 INSTALLATION

- A. Install in accordance with NFPA 90A and NFPA 90B.
- B. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

Small-Capacity Split-System Air Conditioners	12813	23 8126.13 3
--	-------	--------------



## SECTION 25 1400 - INTEGRATED AUTOMATION LOCAL CONTROL UNITS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Application Specific Controllers (ASC):
  - 1. Terminal unit controller.

#### 1.2 RELATED REQUIREMENTS

- A. Section 23 3600 - Air Terminal Units.
- B. Section 25 3516 - Integrated Automation Sensors and Transmitters.

#### 1.3 WARRANTY

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

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. The facility has an existing Alerton building automation system (BAS). The new VAV air terminal controllers and space temperature sensors shall be Alerton-based or fully compatible with the existing facility Alerton BAS.

#### 2.2 APPLICATION SPECIFIC CONTROLLERS

- A. Terminal Unit Controller:
  - 1. Inputs: 4-binary and 3-analog and flow sensor.
  - 2. Outputs: 2-binary and 6-analog (configurable).
  - 3. Actuator: Electrically-operated non-reversible type with a 60 seconds stroke.
  - 4. Peripheral Communications: BACnet MS/TP data bus over screw terminal block.
  - 5. Accessories:
    - a. Zone temperature sensor with built-in occupancy override and occupancy sensor. There should be no user adjustable interface, unless it is software disabled. Preference is for no temperature setpoint adjusting knob or slider.
    - b. Transformers, on-off switch, relays, transducers, vinyl-metallic adhesive identification tags, and programing software.
  - 6. Mounting:
    - a. Field: Provide a terminal unit mounted NEMA 250, Type 1 control panel complying with NEMA 250 and UL 50 or UL 50E use in non-hazardous locations.
    - b. Factory-mounting of Alerton-compatible controls is also permissible.
- B. Existing Space Temperature Sensors:
  - 1. The existing VAV terminals utilize Alerton space temperature sensors with user adjustable sliders to vary a software-defined setpoint range. For the

Integrated Automation Local Control Units	12813	25 1400 2
---	-------	-----------

existing VAV terminals that are to remain, these existing space temperature sensors may be reused (and are indicated as such on plans), however the slider adjustment should be reprogrammed to a zero degree setting, preventing any user adjustments of the programmed space temperature setpoint.

- C. Wire Connections: Device to feature removable wire terminals.
- D. Control Sequences: Based on controller-manufacturer standard.
- E. Communications Protocol: compatible with existing Alerton legacy front end.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Network: Install communication bus between Local Control Units (LCU) to allow system interface through existing Alerton legacy front end.
- B. Programming: Configure, download, test, and debug software codes per LCU-type to match intended application specific sequences of operation.

END OF SECTION

Integrated Automation Local Control Units	12813	25 1400 2
---	-------	-----------



## SECTION 26 0505 - SELECTIVE DEMOLITION FOR ELECTRICAL

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical demolition.

### PART 2 PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Beginning of demolition means installer accepts existing conditions.

#### 3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

#### 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Remove, relocate, and extend existing installations to accommodate new construction.
- B. Remove abandoned wiring to source of supply.
- C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

#### 3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

## SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

#### 1.3 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2014).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers 2005 (Reapproved 2015).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation 2018.
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes 2013.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
--	-------	------------

- J. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable 2012.
- K. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC) 2012.
- L. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2009.
- M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- N. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.
- O. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- P. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- Q. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- R. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- S. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.
- U. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### 1.7 FIELD CONDITIONS

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

**PART 2 PRODUCTS**

**2.1 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is permitted only as follows:
  - 1. Where not otherwise restricted, may be used:
    - a. Where concealed in hollow stud walls, above accessible ceilings and under raised floors for branch circuits up to 20 A.
      - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
  - 2. In addition to other applicable restrictions, may not be used:
    - a. Where not approved for use by the authority having jurisdiction.
    - b. Where exposed to view.
    - c. Where exposed to damage.
    - d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
    - e. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
- H. Manufactured wiring systems are not permitted.

**2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide new conductors and cables manufactured not more than one year prior to installation.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- E. Comply with NEMA WC 70.

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------

- F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- H. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- I. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- J. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
  - 2. Control Circuits: 14 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.
    - d. For control circuits, comply with manufacturer's recommended color code.

## 2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------

- B. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
  - 2. Control Circuits: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 4 AWG and Larger: Type XHHW-2.

#### 2.4 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN or THHN/THWN-2.
- E. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- F. Grounding: Full-size integral equipment grounding conductor.
  - 1. Provide additional insulated grounding conductor where indicated or required.
- G. Armor: Aluminum or steel, interlocked tape.
- H. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

#### 2.5 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors.
- D. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------

2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
  5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
  6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
  7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- H. Mechanical Connectors: Provide bolted type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

## 2.6 WIRING ACCESSORIES

- A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
  3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------



4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
  5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
  - C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
  - D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
  - E. Cable Ties: Material and tensile strength rating suitable for application.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as shown on the drawings.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### 3.3 INSTALLATION

- A. Circuiting Requirements:
  1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated and routing is not shown, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
- B. Install products in accordance with manufacturer's instructions.
- C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles or grid.
  2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- H. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
    - a. Use listed fittings.
    - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
    - c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.
- K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- M. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- N. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  3. Wet Locations: Use heat shrink tubing.
- O. Insulate ends of spare conductors using vinyl insulating electrical tape.
- P. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- Q. Identify conductors and cables in accordance with Section 26 0553.
- R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### 3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
  1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

Low-Voltage Electrical Power Conductors and Cables	12813	26 0519 10
---	-------	------------

## SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0536 - Cable Trays for Electrical Systems: Additional grounding and bonding requirements for cable tray systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.
- D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

#### 1.4 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Grounding and Bonding for Electrical Systems	12813	26 0526 3
--	-------	-----------

D. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:

1. Use insulated copper conductors unless otherwise indicated.
  - a. Exceptions:
    - 1) Use bare copper conductors where installed underground in direct contact with earth.
    - 2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  - a. Exceptions:

Grounding and Bonding for Electrical Systems	12813	26 0526 3
---	-------	-----------

- 1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors for accessible connections.
  - a. Exceptions:
    - 1) Use exothermic welded connections for connections to metal building frame.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45-degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
  1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
  2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.
- D. Make grounding and bonding connections using specified connectors.
  1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 0553.

END OF SECTION

Grounding and Bonding for Electrical Systems	12813	26 0526 3
---	-------	-----------





## SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- C. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

#### 1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- D. MFMA-4 - Metal Framing Standards Publication 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.5 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

Hangers and Supports for Electrical Systems	12813	26 0529 5
---	-------	-----------

- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.1 SUPPORT AND ATTACHMENT COMPONENTS

#### A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Do not use chain, perforated pipe strap or wood for permanent supports unless specifically indicated or permitted.
6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
  - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

#### B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

#### C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

#### D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.

1. Comply with MFMA-4.
2. Channel Material:
  - a. Indoor Dry Locations: Use painted steel, zinc-plated steel or galvanized steel.

Hangers and Supports for Electrical Systems	12813	26 0529 5
---	-------	-----------

3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
  4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch (13 mm) diameter.
    - b. Single Conduit up to 1 inch (27mm) trade size: 1/4 inch (6 mm) diameter.
    - c. Single Conduit larger than 1 inch (27mm) trade size: 3/8 inch (10 mm) diameter.
    - d. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
    - e. Outlet Boxes: 1/4 inch (6 mm) diameter.
    - f. Luminaires: 1/4 inch (6 mm) diameter.
- F. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Concrete: Use expansion anchors or screw anchors.
  3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  4. Hollow Masonry: Use toggle bolts.
  5. Hollow Stud Walls: Use toggle bolts.
  6. Steel: Use beam clamps, machine bolts or welded threaded studs.
  7. Sheet Metal: Use sheet metal screws.
  8. Wood: Use wood screws.
  9. Plastic and lead anchors are not permitted.
  10. Powder-actuated fasteners are not permitted.
  11. Hammer-driven anchors and fasteners are not permitted.
  12. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.

Hangers and Supports for Electrical Systems	12813	26 0529 5
--	-------	-----------

- B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
  1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- J. Box Support and Attachment: Also comply with Section 26 0533.16.
- K. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.
- L. Secure fasteners according to manufacturer's recommended torque settings.
- M. Remove temporary supports.
- N. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

### 3.3 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

Hangers and Supports for Electrical Systems	12813	26 0529 5
---	-------	-----------

END OF SECTION

Hangers and Supports for Electrical Systems	12813	26 0529 5
--	-------	-----------



## SECTION 26 0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Liquid tight flexible nonmetallic conduit (LFNC).
- G. Conduit fittings.
- H. Accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2015.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2015.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC) 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.
- I. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- J. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- K. UL 360 - Liquid-Tight Flexible Steel Conduit Current Edition, Including All Revisions.
- L. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- M. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

- N. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.
- O. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

##### B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

#### 1.5 QUALITY ASSURANCE

##### A. Conform to requirements of NFPA 70.

##### B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

##### A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC) or electrical metallic tubing (EMT).



- D. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC) or electrical metallic tubing (EMT).
- E. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC) or electrical metallic tubing (EMT).
- F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- G. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC) or electrical metallic tubing (EMT).
- H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
  - 1. Locations subject to physical damage include, but are not limited to:
    - a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.
- I. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
  - 1. Maximum Length: 6 feet (1.8 m).
- J. Connections to Vibrating Equipment:
  - 1. Dry Locations: Use flexible metal conduit.
  - 2. Damp, Wet, or Corrosive Locations: Use liquid tight flexible metal conduit.
  - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
  - 4. Vibrating equipment includes, but is not limited to:
    - a. Transformers.
    - b. Motors.

## 2.2 CONDUIT REQUIREMENTS

- A. Communications Systems Conduits: Comply with requirements of this section.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Communications - Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Horizontal Distribution Circuits: 1 inch (27 mm) trade size.
  - 2. Underground, Interior: 1 inch (27 mm) trade size.
  - 3. Underground, Exterior: 1 inch (27 mm) trade size.
- E. Power and Lighting - Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
  - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
  - 3. Control Circuits: 1/2 inch (16 mm) trade size.
  - 4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.

- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### 2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### 2.4 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
  - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### 2.5 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

### 2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

### 2.7 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  - 3. Connectors and Couplings: Use compression (gland) type.
    - a. Do not use indenter type connectors and couplings.
    - b. Do not use set-screw type connectors and couplings.
  - 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

## 2.8 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

- A. Description: NFPA 70, Type LFNC liquid tight flexible nonmetallic conduit listed and labeled as complying with UL 1660.
- B. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

## 2.9 ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install liquid tight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.

F. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated and routing is not shown, determine exact routing required.
3. Conceal all conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
  - a. Electrical rooms.
  - b. Mechanical equipment rooms.
5. Unless otherwise approved, do not route conduits exposed:
  - a. Across floors.
  - b. Across roofs.
  - c. Across top of parapet walls.
  - d. Across building exterior surfaces.
6. Arrange conduit to maintain adequate headroom, clearances, and access.
7. Arrange conduit to provide no more than the equivalent of four 90-degree bends between pull points.
8. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
9. Route conduits above water and drain piping where possible.
10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
11. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
12. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
  - a. Heaters.
  - b. Hot water piping.
  - c. Flues.
13. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.

- a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  - 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
  - 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
  - 8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
  - 9. Use of spring steel conduit clips for support of conduits is not permitted.
  - 10. Use of wire for support of conduits is not permitted.
  - 11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- H. Connections and Terminations:
- 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  - 3. Use suitable adapters where required to transition from one type of conduit to another.
  - 4. Provide drip loops for liquid tight flexible conduit connections to prevent drainage of liquid into connectors.
  - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  - 6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  - 7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- I. Penetrations:
- 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  - 4. Conceal bends for conduit risers emerging above ground.
  - 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.

6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
  7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
  9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
- J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.
- K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
  2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- L. Provide grounding and bonding in accordance with Section 26 0526.
- M. Identify conduits in accordance with Section 26 0553.
- 3.3 FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
  - B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
  - C. Correct deficiencies and replace damaged or defective conduits.
- 3.4 CLEANING
- A. Clean interior of conduits to remove moisture and foreign matter.
- 3.5 PROTECTION
- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

## SECTION 26 0533.16 - BOXES FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 2726 - Wiring Devices:
  - 1. Wall plates.
  - 2. Additional requirements for locating boxes for wiring devices.

#### 1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- I. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures.
- B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. Keys for Lockable Enclosures: Two of each different key.

#### 1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.1 BOXES

- A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.



5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
  3. Use raised covers suitable for the type of wall construction and device configuration where required.
  4. Use shallow boxes where required by the type of wall construction.
  5. Do not use "through-wall" boxes designed for access from both sides of wall.
  6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  8. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  9. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
  10. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    - b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
  11. Wall Plates: Comply with Section 26 2726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet (0.56 sq m) and Larger: Provide hinged-cover enclosures.

4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
  - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
  - b. Back Panels: Painted steel, removable.
  - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- G. Box Locations:
  1. Locate boxes to be accessible.
  2. Unless dimensioned, box locations indicated are approximate.
  3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
  4. Locate boxes so that wall plates do not span different building finishes.
  5. Locate boxes so that wall plates do not cross masonry joints.
  6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
  8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
  9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
  10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
  11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- H. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- I. Install boxes plumb and level.
- J. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- K. Install boxes as required to preserve insulation integrity.
- L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- M. Close unused box openings.
- N. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- O. Provide grounding and bonding in accordance with Section 26 0526.
- P. Identify boxes in accordance with Section 26 0553.
- 3.3 CLEANING
- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.
- 3.4 PROTECTION
- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

## SECTION 26 0536 - CABLE TRAYS FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Metal cable tray systems:
  - 1. Metal wire mesh/basket cable tray.

#### 1.2 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0529 - Hangers and Supports for Electrical Systems.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.3 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NEMA VE 1 - Metal Cable Tray Systems 2017.
- E. NEMA VE 2 - Cable Tray Installation Guidelines 2013, with Errata (2016).
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the arrangement of cable tray with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others. Coordinate the work with other trades to avoid installation of obstructions within cable tray required clearances.
  - 2. Coordinate arrangement of cable tray with the dimensions and clearance requirements of the actual products to be installed.
  - 3. Coordinate the work with placement of supports, anchors, etc. required for mounting.
  - 4. Notify of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not begin installation of cables until installation of associated cable tray run is complete.

Cable Trays for Electrical Systems	12813	26 0536 5
------------------------------------	-------	-----------

## 1.5 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cable tray system components and accessories. Include dimensions, materials, fabrication details, finishes, and span/load ratings.
- B. Shop Drawings: Include dimensioned plan views and sections indicating proposed cable tray routing, required clearances, and locations and details of supports, fittings, building element penetrations, and equipment connections.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NEMA VE 2, except do not store cable tray outdoors without cover as permitted in NEMA VE 2.
- B. Handle products carefully to avoid damage to finish.

## PART 2 PRODUCTS

### 2.1 CABLE TRAY SYSTEM - GENERAL REQUIREMENTS

- A. Provide new cable tray system consisting of all required components, fittings, supports, accessories, etc. as necessary for a complete system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Do not use cable tray for applications other than as permitted by NFPA 70 and product listing/classification.
- D. Provide cable tray system and associated components suitable for use at indicated span/load ratings under the service conditions at the installed location.
- E. Unless otherwise indicated, specified span/load ratings are according to NEMA VE 1 (metal cable tray systems) or NEMA FG 1 (fiberglass cable tray systems) with safety factor of 1.5 and working load only (no additional concentrated static load).
- F. Unless otherwise indicated, specified load/fill depths and inside widths are nominal values according to NEMA VE 1 (metal cable tray systems) or NEMA FG 1 (fiberglass cable tray systems) with applicable allowable tolerances.

### 2.2 METAL CABLE TRAY SYSTEMS

- A. Comply with NEMA VE 1.
- B. Finishes:
  - 1. Zinc Electroplated Steel: Comply with ASTM B633.
- C. Metal Wire Mesh/Basket Cable Tray:
  - 1. Material: Zinc electroplated steel or mill-galvanized before fabrication (pre-galvanized) steel.
  - 2. Tray Depth: As indicated on drawings.
  - 3. Span/Load Rating: As indicated on drawings.

4. Mesh Spacing: 2 by 4 inches (51 by 102 mm).
5. Tray Width: As indicated on drawings.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that work likely to damage cable tray system has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that the dimensions and span/load ratings of cable tray system components are consistent with the indicated requirements.
- D. Verify that mounting surfaces are ready to receive cable tray and associated supports.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install cable tray in accordance with NECA 1 (general workmanship), and NEMA VE 2.
- C. Unless otherwise indicated, arrange cable tray to be parallel or perpendicular to building lines.
- D. Arrange cable tray to provide required clearances and maintain cable access.
- E. Install cable tray plumb and level, with sections aligned and with horizontal runs at the proper elevation.
- F. Metal Wire Mesh/Basket Cable Tray: Field fabricate fittings in accordance with manufacturer's instructions, using only manufacturer-approved connectors classified for bonding.
  1. Inside Radius of Fittings: 12 inches (305 mm).
- G. Cable Tray Movement Provisions:
  1. Provide suitable expansion fittings where cable tray is subject to movement, including but not limited to:
    - a. Where cable tray crosses structural joints intended for expansion.
    - b. Long straight cable tray runs in accordance with NEMA VE 2.
  2. Use expansion guides in lieu of hold-down clamps where prescribed in NEMA VE 2.
  3. Set gaps for expansion fittings in accordance with NEMA VE 2.
- H. Cable Provisions:
  1. Use suitable fixed barrier strips to maintain separation of cables as indicated and as required by NFPA 70.
  2. Use suitable drop-out fittings or bushings where cables exit cable tray as required to maintain minimum cable bending radius.

3. Use suitable cable support fittings for long vertical cable tray runs with heavy cables.
  - I. Provide end closures at unconnected ends of cable tray runs.
  - J. Cable Tray Support:
    1. Use manufacturer's recommended hangers and supports, located in accordance with NEMA VE 2 and manufacturer's requirements, but not exceeding specified span unless otherwise approved by Engineer. Provide required support and attachment in accordance with Section 26 0529, where not furnished by cable tray manufacturer.
    2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  - K. Grounding and Bonding Requirements, in Addition to Requirements of Section 26 0526:
    1. Comply with grounding and bonding requirements of NEMA VE 2.
    2. Metal Cable Tray Systems: Use suitable bonding jumpers or classified connectors to provide electrical continuity.
  - L. Conduit Termination:
    1. Use listed cable tray conduit clamps (evaluated for bonding connection) to terminate conduits at cable tray.
    2. Provide insulating bushing at conduit termination to protect cables.
    3. Provide independent support for conduit.
  - M. Penetrations: Install firestopping to preserve fire resistance rating of building elements, using materials and methods specified in Section 07 8400.
  - N. Identification Requirements, in Addition to Those Specified in Section 26 0553.
- 3.3 FIELD QUALITY CONTROL
- A. Inspect cable tray system for damage and defects.
  - B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
  - C. Correct deficiencies and replace damaged or defective cable tray system components.
- 3.4 ADJUSTING
- A. Adjust tightness of mechanical connections to manufacturer's recommended torque settings.
- 3.5 CLEANING
- A. Remove dirt and debris from cable tray.
  - B. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.
- 3.6 PROTECTION

Cable Trays for Electrical Systems	12813	26 0536 5
------------------------------------	-------	-----------



A. Protect cable tray system from subsequent construction operations.

END OF SECTION

Cable Trays for Electrical Systems	12813	26 0536 5
------------------------------------	-------	-----------



## SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.

#### 1.2 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- C. Section 26 0536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

#### 1.3 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace 2018.
- E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

#### 1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

#### 1.6 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------

## PART 2 PRODUCTS

### 2.1 IDENTIFICATION REQUIREMENTS

#### A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
  - a. Panelboards:
    - 1) Identify ampere rating.
    - 2) Identify voltage and phase.
    - 3) Identify power source and circuit number. Include location when not within sight of equipment.
    - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
    - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
    - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
  - b. Enclosed switches, circuit breakers and motor controllers:
    - 1) Identify voltage and phase.
    - 2) Identify power source and circuit number. Include location when not within sight of equipment.
    - 3) Identify load(s) served. Include location when not within sight of equipment.
2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
5. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
6. Use identification label on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
7. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

8. Use warning labels, identification nameplates or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    - a. At each source and load connection.
    - b. Within boxes when more than one circuit is present.
    - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
- C. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
  2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).
    - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
      - 1) Color Code:
        - (a) Fire Alarm System: Red.
      - 2) Field-Painting: Comply with Section 09 9123 and 09 9113.
      - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
  3. Use identification labels or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations and at equipment terminations when source is not within sight.
  4. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
  5. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet (6.1 m).
- D. Identification for Boxes:

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------

1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
  - a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
3. Use identification labels to identify circuits enclosed.
  - a. For exposed boxes in public areas, use only identification labels.

E. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
2. Use identification label to identify fire alarm system devices.
  - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
3. Use identification label to identify serving branch circuit for all receptacles.
  - a. For receptacles in all areas, provide identification on inside surface of wallplate.
4. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
5. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

F. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

## 2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
  - a. Indoor Clean, Dry Locations: Use plastic nameplates.
  - b. Outdoor Locations: Use plastic, stainless steel or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------

5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
    - a. Use only for indoor locations.
  2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
  2. Legend:
    - a. System designation where applicable:
      - 1) Fire Alarm System: Identify with text "FIRE ALARM".
    - b. Equipment designation or other approved description.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height:
    - a. System Designation: 1 inch (25 mm).
    - b. Equipment Designation: 1/2 inch (13 mm).
    - c. Other Information: 1/4 inch (6 mm).
    - d. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
  5. Color:
    - a. Normal Power System: White text on black background.
    - b. Fire Alarm System: White text on red background.
- D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
  2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/4 inch (6 mm).
  5. Color: Black text on white background unless otherwise indicated.
    - a. Exceptions:
      - 1) Provide white text on red background for general information or operational instructions for fire alarm systems.
- E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------

2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch (13 mm).
  5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
  2. Legend: Power source and circuit number or other designation indicated.
    - a. Include voltage and phase for other than 120 V, single phase circuits.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch (5 mm).
  5. Color: Black text on clear background.
- G. Format for Control Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
  2. Legend: Load controlled or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch (5 mm).
  5. Color: Black text on clear background.
- H. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
  2. Legend: Designation indicated and device zone or address.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch (5 mm).
  5. Color: Red text on white background.

## 2.3 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
1. Do not use handwritten text.
- E. Minimum Text Height: 1/8 inch (3 mm).

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------



F. Color: Black text on white background unless otherwise indicated.

## 2.4 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth or vinyl snap-around type markers.

B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

C. Minimum Size:

1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).

2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).

4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

D. Legend:

1. Markers for Voltage Identification: Highest voltage present.

E. Color: Black text on orange background unless otherwise indicated.

## 2.5 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

a. Do not use labels designed to be completed using handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### 3.2 INSTALLATION

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------

- A. Install products in accordance with manufacturer's instructions.
  - B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
    - 1. Surface-Mounted Equipment: Enclosure front.
    - 2. Flush-Mounted Equipment: Inside of equipment door.
    - 3. Free-Standing Equipment: Enclosure front; also, enclosure rear for equipment with rear access.
    - 4. Elevated Equipment: Legible from the floor or working platform.
    - 5. Branch Devices: Adjacent to device.
    - 6. Interior Components: Legible from the point of access.
    - 7. Conduits: Legible from the floor.
    - 8. Boxes: Outside face of cover.
    - 9. Conductors and Cables: Legible from the point of access.
    - 10. Devices: Inside face of cover.
  - C. Install identification products centered, level, and parallel with lines of item being identified.
  - D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
  - E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
  - F. Secure rigid signs using stainless steel screws.
- 3.3 FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
  - B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

Identification for Electrical Systems	12813	26 0553 8
---------------------------------------	-------	-----------

## SECTION 26 0923 - LIGHTING CONTROL DEVICES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Occupancy sensors.
- B. Daylighting controls.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches and wall dimmers.
  - 1. Includes finish requirements for wall controls specified in this section.
- F. Section 26 5100 - Interior Lighting.
- G. Section 26 5600 - Exterior Lighting.

#### 1.3 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices current edition.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control Current Edition, Including All Revisions.
- G. UL 916 - Energy Management Equipment Current Edition, Including All Revisions.
- H. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
  - 3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
  - 4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate

placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

## 1.5 SUBMITTALS

- A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
- B. Operation and Maintenance Data: Include detailed information on device programming and setup.
- C. Project Record Documents: Record actual installed locations and settings for lighting control devices.

## 1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

## 1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

## 1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## 1.9 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide five year manufacturer warranty for all daylighting controls.

## PART 2 PRODUCTS

### 2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

### 2.2 OCCUPANCY SENSORS

- A. All Occupancy Sensors:
  1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
  2. Sensor Technology:
    - a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
  4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
  5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
  6. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
  7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
- B. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
    - b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    - c. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
- C. Wall Dimmer Occupancy Sensors:
1. General Requirements:
    - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
    - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
    - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
    - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
    - e. Provide field adjustable dimming preset for occupied state.

- f. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

D. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:

- a. Description: Low profile occupancy sensors designed for ceiling installation.
- b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
- c. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
- d. Finish: White unless otherwise indicated.

2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

3. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:

- a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

E. Power Packs for Low Voltage Occupancy Sensors:

- 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
- 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
- 3. Input Supply Voltage: As indicated on the drawings.
- 4. Load Rating: As required to control the load indicated on drawings.

## 2.3 DAYLIGHTING CONTROLS

A. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.

B. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.

- 1. Sensor Type: Filtered silicon photo diode.

2. Sensor Range:
  - a. Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
3. Finish: White unless otherwise indicated.
4. Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.
5. Wireless Daylighting Control Photo Sensors:
  - a. RF Range: 30 feet (9 m) through typical construction materials.
  - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
  - c. Power: Battery-operated with minimum ten-year battery life.
- C. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts, for direct continuous dimming of up to 50 ballasts.
- D. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
  1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
  2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  3. Control Capability:
- E. Daylighting Control Switching Modules for Wireless Sensors:
  1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
  2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
  3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
  4. Control Capability: Capable of controlling one programmable channel.
  5. Input Supply Voltage: Dual rated for 120/277 V ac.
- F. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and

switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.

1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
2. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
3. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
4. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.

G. Daylighting Control Dimming Modules for Wireless Sensors:

1. Description: Plenum rated control unit compatible with specified wireless photo sensors and with specified dimming ballasts, for continuous dimming of compatible dimming ballasts in response to changes in measured light levels according to selected settings.
2. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
3. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
4. Control Capability: Capable of controlling up to 32 ballasts with up to two separately programmable daylighting zones.

H. Power Packs for Low Voltage Daylighting Control Modules:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
2. Input Supply Voltage: Dual rated for 120/277 V ac.
3. Load Ratings: As required to control the load indicated on drawings.

I. Accessories:

1. Where indicated, provide compatible accessory wall switches for manual override control.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.



- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.3 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
- G. Provide required supports in accordance with Section 26 0529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Occupancy Sensor Locations:
  - 1. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- J. Daylighting Control Photo Sensor Locations:
  - 1. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

2. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- K. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
  - L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect each lighting control device for damage and defects.
- B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area.
- C. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable.
- D. Correct wiring deficiencies and replace damaged or defective lighting control devices.

### 3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

### 3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.7 CLOSEOUT ACTIVITIES

- A. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

2. Provide minimum of two hours of training.
3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
4. Location: At project site.

END OF SECTION



## SECTION 26 2416 - PANELBOARDS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Overcurrent protective devices for panelboards.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.3 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e (Amended 2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA PB 1 - Panelboards 2011.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- F. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems 2017.
- G. NFPA 70 - National Electric Code; National Fire Protection Association; 2014.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- J. UL 67 - Panelboards Current Edition, Including All Revisions.
- K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- L. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.
- M. UL 1053 - Ground-Fault Sensing and Relaying Equipment Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

Panelboards	12813	26 2416 5
-------------	-------	-----------

3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

#### 1.5 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

#### 1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### PART 2 PRODUCTS

#### 2.1 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  1. Altitude: Less than 6,600 feet (2,000 m).
  2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
  1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  2. Listed series ratings are acceptable only where specifically indicated.
  3. Label equipment utilizing series ratings as required by NFPA 70.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

3. Provide separate isolated/insulated ground bus where indicated or where isolated grounding conductors are provided.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Indoor Clean, Dry Locations: Type 1.
  2. Boxes: Galvanized steel unless otherwise indicated.
    - a. Provide wiring gutters sized to accommodate the conductors to be installed.
    - b. Provide removable end walls for NEMA Type 1 enclosures.
    - c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
  3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
  4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Load centers are not acceptable.
- 2.2 POWER DISTRIBUTION PANELBOARDS - EXISTING TO REMAIN
- A. Circuit Breakers:
1. Provide bolt-on type.
  2. Provide thermal magnetic circuit breakers unless otherwise indicated.
- 2.3 LIGHTING AND APPLIANCE PANELBOARDS - EXISTING TO REMAIN
- A. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- 2.4 OVERCURRENT PROTECTIVE DEVICES
- A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      - 2) 14,000 rms symmetrical amperes at 480 VAC.

- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- 3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
  - b. Provide interchangeable trip units where indicated.
- 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- 6. Provide the following circuit breaker types where indicated:
- 7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
- 8. Do not use tandem circuit breakers.
- 9. Do not use handle ties in lieu of multi-pole circuit breakers.
- 10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
- 11. Provide the following features and accessories where indicated or where required to complete installation:
  - a. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

## 2.5 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install all field-installed branch devices, components, and accessories.
- C. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.



- D. Provide filler plates to cover unused spaces in panelboards.
- E. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Emergency and night lighting circuits.
  - 2. Fire detection and alarm circuits.
  - 3. Communications equipment circuits.
  - 4. Intrusion detection and access control system circuits.
- F. Identify panelboards in accordance with Section 26 0553.

### 3.3 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

### 3.4 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### 3.5 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

END OF SECTION



## SECTION 26 2726 - WIRING DEVICES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 0533.16 - Boxes for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### 1.3 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2017h.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification) 2017g.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2015).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2016.
- G. NFPA 70 - National Electric Code; National Fire Protection Association; 2014.
- H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters Current Edition, Including All Revisions.
- L. UL 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

## 1.5 QUALITY ASSURANCE

- A. Products: Listed, classified, and labeled as suitable for the purpose intended.

## 1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

## PART 2 PRODUCTS

### 2.1 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- E. Provide GFCI protection for receptacles serving electric drinking fountains.
- F. Unless noted otherwise, do not use combination switch/receptacle devices.

### 2.2 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

### 2.3 WALL SWITCHES

- A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  1. Wiring Provisions: Terminal screws for side wiring with separate ground terminal screw.
- B. Standard Wall Switches: Commercial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way or four way as indicated on the drawings.

### 2.4 WALL DIMMERS

- A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

## 2.5 RECEPTACLES

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Isolated Ground Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; isolated ground triangle mark on device face; single or duplex as indicated on the drawings.
  - 3. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- C. GFCI Receptacles:
  - 1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    - a. Provide test and reset buttons of same color as device.
  - 2. Standard GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  - 3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

## 2.6 WALL PLATES

- A. Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
  - 3. Screws: Metal with slotted heads finished to match wall plate finish.

- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.3 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect

grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

#### 3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

#### 3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

#### 3.6 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION





## SECTION 26 2816.16 - ENCLOSED SWITCHES

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Enclosed safety switches.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 2813 - Fuses.

#### 1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2018.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- G. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

#### 1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

Enclosed Switches	12813	26 2816.16 4
-------------------	-------	--------------

- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

## 1.6 QUALITY ASSURANCE

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

## PART 2 PRODUCTS

### 2.1 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet (2,000 m).
  - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. Minimum Ratings:
    - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
    - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

- J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- L. Heavy Duty Switches:
  - 1. Comply with NEMA KS 1.
  - 2. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Identify enclosed switches in accordance with Section 26 0553.

#### 3.3 FIELD QUALITY CONTROL

- A. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

#### 3.4 ADJUSTING

Enclosed Switches	12813	26 2816.16 4
-------------------	-------	--------------

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### 3.5 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

## SECTION 26 5100 - INTERIOR LIGHTING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Interior luminaires.
- B. Exit signs.
- C. Drivers.
- D. Lamps.
- E. Luminaire accessories.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0533.16 - Boxes for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including daylighting controls.
- D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- E. Section 26 5600 - Exterior Lighting.

#### 1.3 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices current edition.
- B. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- C. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products 2008.
- D. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems 2006.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2016.
- H. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012.
- I. NFPA 70 - National Electric Code; National Fire Protection Association; 2014.
- J. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.
- L. UL 1598 - Luminaires Current Edition, Including All Revisions.
- M. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

#### 1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

##### 1. LED Luminaires:

- a. Include estimated useful life, calculated based on IES LM-80 test data.
- b. Include IES LM-79 test report upon request.

B. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
2. Extra Driver: Two percent of total quantity installed for each type, but not less than one of each type.

#### 1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting) and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

## 1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

## 1.9 WARRANTY

- A. Provide three-year manufacturer warranty for all LED luminaires, including drivers.
- B. Provide ten-year pro-rata warranty for batteries for self-powered exit signs.

## PART 2 PRODUCTS

### 2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### 2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. LED Luminaires:
  1. Components: UL 8750 recognized or listed as applicable.
  2. Tested in accordance with IES LM-79 and IES LM-80.
  3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

### 2.3 EXIT SIGNS

- A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes and listed and labeled as complying with UL 924.
  1. Number of Faces: Single or double as indicated or as required for the installed location.
  2. Directional Arrows: As indicated or as required for the installed location.
- B. Self-Powered Exit Signs:

1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
4. Provide low voltage disconnect to prevent battery damage from deep discharge.
5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

## 2.4 DRIVERS

### A. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.
  - a. Wall Dimmers: See Section 26 2726.

## 2.5 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.



- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.3 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA 500 (commercial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires.
  - 3. Secure pendant-mounted luminaires to building structure.
  - 4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 5. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Exit Signs:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
  - 2. Install lock-on device on branch circuit breaker serving units.
- J. Identify luminaires connected to emergency power system in accordance with Section 26 0553.
- K. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

### 3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs to verify proper operation upon loss of normal power supply.

- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### 3.5 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

### 3.6 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting) and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### 3.7 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
- B. Just prior to Substantial Completion, replace all lamps that have failed.

### 3.8 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

## SECTION 26 5600 - EXTERIOR LIGHTING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Exterior luminaires.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0533.16 - Boxes for Electrical Systems.
- D. Section 26 5100 - Interior Lighting.

#### 1.3 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices current edition.
- B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products 2008.
- C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules 2015, with Errata (2017).
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2006.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 1598 - Luminaires Current Edition, Including All Revisions.
- H. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits Current Edition, Including All Revisions.
- I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### 1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
  - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:

- a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.6 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

- A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.3 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Install accessories furnished with each luminaire.
- G. Bond products and metal accessories to branch circuit equipment grounding conductor.
- H. Install lamps in each luminaire.

### 3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

### 3.5 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

### 3.6 CLEANING

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

### 3.7 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION



## SECTION 27 1000 - STRUCTURED CABLING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications equipment room fittings.
- F. Communications outlets.
- G. Communications grounding and bonding.
- H. Communications identification.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
  - 1. Includes bonding jumpers for bonding of communications systems and electrical system grounding.
- B. Section 26 0533.13 - Conduit for Electrical Systems.
- C. Section 26 0536 - Cable Trays for Electrical Systems.
- D. Section 26 0533.16 - Boxes for Electrical Systems.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products.
- F. Section 26 2726 - Wiring Devices.

#### 1.3 REFERENCE STANDARDS

- A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment Revision E, 2005.
- B. NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling 2006.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set 2019.
- E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards 2009c, with Addendum (2016).
- F. TIA-569 - Telecommunications Pathways and Spaces 2019e.
- G. TIA-606 - Administration Standard for Telecommunications Infrastructure 2017c.
- H. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises 2019d.
- I. UL 444 - Communications Cables Current Edition, Including All Revisions.

- J. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers Current Edition, Including All Revisions.
- K. UL 1863 - Communications-Circuit Accessories Current Edition, Including All Revisions.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
  - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Arrange for Communications Service Provider to provide service.

#### 1.5 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- C. Evidence of qualifications for installer.
- D. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
  - 1. Record actual locations of outlet boxes and distribution frames.
  - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
  - 3. Identify distribution frames and equipment rooms by room number on drawings.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
  - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
  - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.



- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

#### 1.8 WARRANTY

- A. Correct defective Work within a 2 year period after Date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
  - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
  - 2. Comply with Communications Service Provider requirements.
  - 3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
  - 4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
  - 5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
  - 1. Locate main distribution frame in Telecommunications Room.
  - 2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
- C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

#### 2.2 PATHWAYS

- A. Conduit: As specified in Section 26 0533.13; provide pull cords in all conduit.
- B. Cable Trays: As specified in Section 26 0536.

#### 2.3 COPPER CABLE AND TERMINATIONS

- A. Copper Horizontal Cable:
  - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.

Structured Cabling	12813	27 1000 7
--------------------	-------	-----------

2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
  3. Cable Capacity: 4-pair.
  4. Cable Applications:
    - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
    - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
    - c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
  5. Cable Jacket Color - Voice and Data Cable: Blue.
- B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
  2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
- D. Copper Patch Cords:
1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
  2. Patch Cords for Patch Panels:
    - a. Quantity: One for each pair of patch panel ports.

## 2.4 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

- A. Copper Cross-Connection Equipment:
1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
  2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
    - a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
    - b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
    - c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
    - d. Provide incoming cable strain relief and routing guides on back of panel.

- B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
  - 1. Do not paint over UL label.
- C. Equipment Frames, Racks and Cabinets:
  - 1. Component Racks: EIA/ECA-310 standard 19 inch (482.6 mm) wide.
  - 2. Floor Mounted Racks: Aluminum or steel construction with corrosion resistant finish; vertical and horizontal cable management channels, top and bottom cable troughs, and grounding lug.

## 2.5 COMMUNICATIONS OUTLETS

- A. Outlet Boxes: Comply with Section 26 0533.16.
  - 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
  - 2. Minimum Size, Unless Otherwise Indicated:
    - a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.
- B. Wall Plates:
  - 1. Comply with system design standards and UL 514C.
  - 2. Accepts modular jacks/inserts.
  - 3. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726.

## 2.6 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.
- B. Comply with Section 26 0526.

## 2.7 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.
- B. Comply with Section 26 0553.

## 2.8 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Factory test cables according to TIA-568 (SET).

## PART 3 EXECUTION

### 3.1 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

### 3.2 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
  1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
  2. 12 inches (300 mm) from power conduits and cables and panelboards.
  3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
  4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Conduit, in Addition to Requirements of Section 26 0533.13:
  1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
  2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
  3. Arrange conduit to provide no more than 100 feet (30 m) between pull points.
- C. Outlet Boxes:
  1. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of telecommunications outlets provided under this section.
    - a. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
    - b. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
    - c. Locate outlet boxes so that wall plate does not span different building finishes.
    - d. Locate outlet boxes so that wall plate does not cross masonry joints.

### 3.3 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
  1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
  2. Do not over-cinch or crush cables.
  3. Do not exceed manufacturer's recommended cable pull tension.
  4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
  1. At Distribution Frames: 120 inches (3000 mm).
  2. At Outlets - Copper: 12 inches (305 mm).
- C. Copper Cabling:
  1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.

2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
  3. Use T568B wiring configuration.
- D. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.
- E. Identification:
1. Use wire and cable markers to identify cables at each end.
  2. Use manufacturer-furnished label inserts, identification labels or engraved wallplate to identify each jack at communications outlets with unique identifier.
  3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

#### 3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
  4. Inspect patch cords for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
1. Test operation of shorting bars in connection blocks.
  2. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION



## SECTION 28 4600 - FIRE DETECTION AND ALARM

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Notification appliances.
- B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

#### 1.2 RELATED REQUIREMENTS

- A. Section 26 0553 - Identification for Electrical Systems.

#### 1.3 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; 2014.
- E. NFPA 72 - National Fire Alarm and Signaling Code Most Recent Edition Cited by Referring Code or Reference Standard.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product, including furnished options and accessories.
  - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
  - 2. Include rated capacities, operating characteristics, and electrical characteristics.
- B. Inspection and Test Reports:
  - 1. Submit inspection and test plan prior to closeout demonstration.
  - 2. Submit documentation of satisfactory inspections and tests.
  - 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- C. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
  - 1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data.
  - 2. In addition to the items in quantities indicated in PART 2, furnish the following:
    - a. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.

- b. Keys and Tools: One extra set for access to locked or tamperproofed components.
- c. Audible and Visual Notification Appliances: One of each type installed.

## 1.5 PROJECT CONDITIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify Owner no fewer than seven days in advance of proposed interruption of fire-alarm service.
  - 2. Do not proceed with interruption of fire-alarm service without Owner's written permission.
- B. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

## 1.6 WARRANTY

- A. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Existing Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn/strobe evacuation. Additional devices are being added to existing system, some devices being removed, and some devices being relocated.
- B. Automatic sensitivity control of certain smoke detectors.
- C. All components provided shall be listed for use with the selected system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.2 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate new and remaining components into existing system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

### 2.3 COMPONENTS

- A. General:
  - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.



2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Notification Appliances:
1. General Requirements for Notification Appliances: Connected to a signaling-line circuit, equipped for mounting as indicated, and with screw terminals for system connections.
  2. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
    - a. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
  3. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
  4. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.
    - a. Rated Light Output:
      - 1) 15/30/75/110 cd, selectable in the field.
    - b. Mounting: Wall mounted unless otherwise indicated.
    - c. Flashing shall be in a temporal pattern, synchronized with other units.
    - d. Strobe Leads: Factory connected to screw terminals.
    - e. Mounting Faceplate: Factory finished, red.
- C. Circuit Conductors: Copper or optical fiber in conduit; provide 200 feet (60 m) extra; color code and label.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.
- E. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
- F. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating

mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.

- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.

### 3.2 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Visual Inspection: Conduct visual inspection prior to testing.
- E. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- F. Provide all tools, software, and supplies required to accomplish inspection and testing.
- G. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- H. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

### 3.3 PATHWAYS

- A. Pathways shall be installed in EMT.

### 3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 - Identification for Electrical Systems.

### 3.5 GROUNDING

- A. Ground shielded cables at the control panel location only. Insulate shield at device location.
- B. Comply with requirements specified in Section 26 0526 - Grounding and Bonding for Electrical Systems.

### 3.6 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  - 1. Be prepared to conduct any of the required tests.
  - 2. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
  - 3. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.

- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
1. Spare parts, extra materials, and tools have been delivered.
  2. All aspects of operation have been demonstrated to Owner.
  3. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
  4. Occupancy permit has been granted.

END OF SECTION

# APPENDIX A ASBESTOS SURVEY

## SECTION G





***ASBESTOS SURVEY***

**FORMER BB&T OPERATIONS CENTER  
2221 ORANGE AVENUE, NW  
ROANOKE, VIRGINIA**

**ECS PROJECT NO. 12:8187**

**FOR**

**ROANOKE REGIONAL AIRPORT COMMISSION**

**MAY 6, 2015**



May 6, 2015

Ms. Diana Lewis, AAE  
Roanoke Regional Airport Commission  
5202 Aviation Drive, NW  
Roanoke, Virginia 24012

ECS Project No. 12-8171

Reference: Asbestos Survey  
Former BB&T Operations Center  
1410 Coulter Drive, NW  
Roanoke, Virginia

Dear Ms. Lewis:

ECS Mid-Atlantic, LLC (ECS) is pleased to provide Roanoke Regional Airport Commission with the results of our non-invasive Asbestos-Containing Material (ACM) Survey which were performed at the above referenced site located in Roanoke, Virginia.

Feel free to contact us at (540) 362-2000, if there are questions regarding this report, or if you need further information.

Respectfully,

**ECS MID-ATLANTIC, LLC**

Alexandra Moon  
Environmental Scientist

Christopher J. Chapman, CIH  
Director of Industrial Hygiene

# ACM SURVEY

## TABLE OF CONTENTS

<u>SECTION</u>		<u>PAGE</u>
<b>1.0</b>	<b>Introduction</b>	<b>1</b>
1.1	Purpose and Scope of Work	1
1.2	Site Location and Description	1
<b>2.0</b>	<b>Asbestos-Containing Materials Survey</b>	<b>1</b>
2.1	Sample Locations and Methods	1
2.2	Analytical Test Results	2
	Table 1	2
2.3	Conclusions and Recommendations	4
<b>3.0</b>	<b>Limitations</b>	<b>4</b>
<b>APPENDICES</b>		
Appendix I	Asbestos Analytical Test Results and Chain-of-Custody	



## **1.0 INTRODUCTION**

### **1.1 PURPOSE AND SCOPE OF WORK**

The ACM Survey was performed in general accordance with the scope items identified in ECS proposal 12-11569 authorized on March 31, 2015. The scope of services performed included the following:

- A visual non-invasive evaluation of accessible interior and exterior areas of the building for suspect ACMs, excluding the roof.
- The collection of representative bulk samples of suspect ACMs within each unique and homogeneous area (areas similar in appearance and material composition) utilizing wet sampling methods, clean extraction tools, and personal protective equipment.
- Submittal of collected bulk samples to a subcontracted analytical laboratory, for microscopic analyses utilizing Polarized Light Microscopy (PLM) with dispersion staining using US Environmental Protection Agency (USEPA) protocol in general accordance with NIOSH manual of analytical methods (USEPA 40 CFR Part 763, entitled *Methods for Determination of Asbestos in Bulk Samples*).

### **1.2 SITE LOCATION AND DESCRIPTION**

The site is located at 1410 Coulter Drive, NW in Roanoke, Virginia. The building is approximately 40,315 square feet in size with an 11,178 square foot basement and was originally constructed in 1981.

## **2.0 ASBESTOS-CONTAINING MATERIALS SURVEY**

### **2.1 SAMPLING LOCATIONS AND METHODS**

A survey of the structure, to identify asbestos-containing materials (ACMs), was performed by Ms. Alexandra Moon (VA Asbestos Inspector # 3303 003364) on April 17, 2015. Sample methodology was conducted in general accordance with US EPA and OSHA regulations. Samples were submitted to Environmental Hazards Services, LLC (EHS), which is certified by the National Voluntary Laboratory Accreditation Program to perform analysis of bulk asbestos samples by Polarized Light Microscopy (PLM) to determine the presence and type (if present) of asbestos in accordance with the EPA Method 600/R-93/116. EPA recommended chain-of-custody procedures were maintained throughout the sampling and testing operations. The chain-of-custody, which includes the sample number, sampling location, and homogeneous area description, in addition to bulk sample analysis results, is included in Appendix I.

In general, the interior and exterior finishes were observed to be in good condition. The location of the collected samples, sample numbers and asbestos content are provided in Table I, entitled "*Analytical Results of Materials Found to Contain Asbestos,*" included in this report.

The collected bulk samples were stored in properly labeled and sealed containers. Professional judgment was used in the selection of the number of bulk samples collected for laboratory testing and was in general accordance with US Department of Labor (OSHA) and US EPA NESHAP requirements for asbestos sampling.

## 2.2 ANALYTICAL TEST RESULTS

ACM is defined as any material containing more than one percent (>1%) asbestos as determined using the method specified in US EPA regulation under 40 CFR Part 763, Appendix E, Section 86). A friable ACM is defined as any ACM that, when dry, can be crumbled, pulverized or reduced to powder by hand pressure. A non-friable ACM is defined as any ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Category I non-friable ACMs are listed as follows: pickings, gaskets, resilient floor coverings, and asphalt roofing products containing more than one percent (>1%) asbestos. Category II non-friable ACMs are listed as any material, excluding Category I non-friable ACM, containing more than one percent (>1%) asbestos.

A total of 44 representative bulk samples were collected from the structure during our survey. Positive stop was utilized and several samples were multi layered, so that a total of 53 samples were analyzed.

A separate attachment for the asbestos laboratory analysis is also attached; detailing the samples layers and results.

<b>Table I Asbestos Analytical Findings</b>			
<b>Sample No.</b>	<b>Sample Location</b>	<b>Sample Type</b>	<b>Analytical Results</b>
1410-1 – 1410-2	Men's Bathroom	12"x12" Floor Tile; Beige with Light Trans/BW	NAD
<b>1410-1 – 1410-2</b>	<b>Men's Bathroom</b>	<b>12"x12" Floor Tile Mastic</b>	<b>Trace to 7% Chrysotile</b>
<b>1410-3 – 1410-4</b>	<b>First Floor</b>	<b>12"x12" Floor Tile; Beige with Brown Specks</b>	<b>2% Chrysotile</b>
<b>1410-3 – 1410-4</b>	<b>First Floor</b>	<b>12"x12" Floor Tile Mastic</b>	<b>6% Chrysotile</b>
1410-5 – 1410-6	Water Fountain Area	12"x12" Floor Tile; Blue	NAD
<b>1410-5 – 1410-6</b>	<b>Water Fountain Area</b>	<b>12"x12" Floor Tile Mastic</b>	<b>5% Chrysotile</b>
<b>1410-7 – 1410-8</b>	<b>Entrance</b>	<b>12"x12" Floor Tile Terrazzo Pattern</b>	<b>20% Chrysotile</b>
<b>1410-7 – 1410-8</b>	<b>Entrance</b>	<b>12"x12" Floor Tile Terrazzo Pattern Mastic</b>	<b>2% Chrysotile</b>
1410-9 – 1410-10	Hallway First Floor	12"x12" Floor Tile; Beige with Color Splotches	NAD
1410-11 – 1410-12	Basement	12"x12" Floor Tile; Beige with Black Specks	NAD
1410-13 – 1410-14	Women's Bathroom	12"x12" Floor Tile; Beige with Brown Streaks	NAD
<b>1410-13 – 1410-14</b>	<b>Women's Bathroom</b>	<b>12"x12" Floor Tile Mastic</b>	<b>6% Chrysotile</b>
1410-15 – 1410-16	Throughout	2'x2' Ceiling Tile; Pinhole Punch	NAD
1410-17 – 1410-18	Throughout	2'x4' Ceiling Tile; Pinhole Fissure	NAD

<b>Table I Asbestos Analytical Findings</b>			
<b>Sample No.</b>	<b>Sample Location</b>	<b>Sample Type</b>	<b>Analytical Results</b>
1410-19 – 1410-20	Throughout	2'x4' Ceiling Tile; Pinhole Punch	NAD
1410-21 – 1410-22	Throughout	2'x4' Ceiling Tile; Pinhole	NAD
1410-23 – 1410-24	Throughout	2'x4' Ceiling Tile' 1 inch Fissure & Pin	NAD
1410-25 – 1410-26	Throughout	Cove Base with Mastic	NAD
1410-27 – 1410-29	Boiler Room	Pipe Insulation Sealant	NAD
1410-30 – 1410-31	Boiler Room; Blue Box on Wall	Black Pipe Tar Wrap	NAD
1410-32 – 1410-33	Throughout	Drywall; Wall	NAD
1410-34 – 1410-38	Throughout	Joint Compound	NAD
1410-39 – 1410-40	Exterior	Black Siding Liner	NAD
1410-41 – 1410-42	Exterior	Door Caulk	NAD
1410-43 – 1410-44	Exterior	Window Caulk	NAD

Key: NAD = No Asbestos Detected

#### **FRIABLE ASBESTOS CONTAINING MATERIALS**

No asbestos was detected in samples collected of suspect friable materials identified during this survey.

#### **NON-FRIABLE ASBESTOS CONTAINING MATERIALS**

Asbestos (Trace to 7% Chrysotile) was detected in five representative samples of the black floor tile mastic located throughout the facility. The mastic was in fair condition in the areas observed and is classified as a Category I non-friable ACM. All black mastic throughout the facility should be assumed to contain asbestos and be properly abated prior to renovations.

Asbestos (2% Chrysotile) was detected in one representative sample of the beige floor tile with brown specks located on the first floor of the facility. The floor tile was in fair condition in the areas observed and is classified as a Category I non-friable ACM. All similar material in the structure should be assumed to contain asbestos and be properly abated prior to renovations.

Asbestos (20% Chrysotile) was detected in one representative sample of the terrazzo pattern floor tile located in the entrance hall of the facility. The floor tile was in fair condition in the areas observed and is classified as a Category I non-friable ACM. All similar materials in the structure should be assumed to contain asbestos and be properly abated prior to renovations.

#### **PRESUMED ASBESTOS CONTAINING MATERIALS (THROUGHOUT)**

- Subslab vapor barriers/water proofing
- Fire Doors
- Roofing Materials
- Water Fountain Components
- Elevator Components
- CMU Block Insulation
- CMU Block filler

### **2.3 CONCLUSIONS AND RECOMMENDATIONS**

If additional suspect asbestos-containing materials are uncovered during renovation of the structure, which were not accessible during this survey, it is recommended that these materials be sampled immediately upon discovery for asbestos content in accordance with OSHA Standard 29 CFR 1926.1101 prior to disturbance (reference also list of assumed ACMs in the findings section of this report).

Prior to any renovation activities, ECS recommends that an asbestos abatement specification be prepared for the building if known or suspect ACMs are to be distributed.

All asbestos removal should be performed by properly licensed and accredited contractors.

As good practice, ECS recommends that the site develop an Operations and Maintenance Plan to properly manage asbestos containing materials in-place in accordance with OSHA regulations, should it remain in place after renovations.

During this non-invasive survey ECS attempted to access various areas of the building however, due to the nature of an asbestos assessment and the inability and impracticality of accessing all hidden locations, some areas/materials may still be deemed inaccessible and/or not surveyed.

### **3.0 LIMITATIONS**

The conclusions and recommendations presented within this report are based upon a reasonable level of assessment within normal bounds and standards of professional practice for a site in this particular geographic setting. ECS is not responsible or liable for the discovery and elimination of hazards that may potentially cause damage, accidents, or injuries.

The observations, conclusions, and recommendations pertaining to environmental conditions at the subject site are necessarily limited to conditions observed, and/or materials reviewed at the time this study was undertaken. No warranty, expressed or implied, is made with regard to the conclusions and recommendations presented within this report. This report is provided for the exclusive use of Roanoke Regional Airport Commission. This report is not intended to be used or relied upon in connection with other projects or by other unidentified third parties without the written consent of ECS and Roanoke Regional Airport Commission.

During this study, suspect asbestos samples were submitted for analysis at an NVLAP-accredited laboratory via polarized light microscopy. As with any similar survey of this nature, actual conditions exist only at the precise locations from which suspect asbestos samples were collected. Certain inferences are based on the results of this sampling and related testing to form a professional opinion of conditions in areas beyond those from which the samples were

collected.

Our recommendations are in part based on federal and local regulations and guidelines. ECS does not assume the responsibility of the person(s) in charge of the site, or otherwise undertake responsibility for reporting to any local, state, or federal public agencies any conditions at the site that may present a potential danger to public health, safety, or the environment. Under this scope of services, ECS assumes no responsibility regarding any response actions initiated as a result of these findings. General compliance with regulations and response actions are the sole responsibility of the Client and should be conducted in accordance with local, state, and/or federal requirements.

The client agrees to notify the appropriate local, state, or federal public agencies as required by law, or otherwise to disclose, in a timely manner, information that may be necessary to prevent any danger to public health, safety, or the environment.

**APPENDIX I**

**ASBESTOS ANALYTICAL TEST RESULTS AND CHAIN-OF-CUSTODY**



# Asbestos Bulk Analysis Report

Environmental Hazards Services, L.L.C.

7469 Whitepine Rd  
Richmond, VA 23237

Telephone: 800.347.4010

Report Number: 15-04-02552

Client: ECS-Mid-Atlantic LLC- Roanoke  
7670 Enon Drive  
Suite 101  
Roanoke, VA 24019

Received Date: 04/21/2015  
Analyzed Date: 04/23/2015, 04/24/2015  
Reported Date: 04/24/2015

Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Client Number:  
200608

Fax Number:

## Laboratory Results

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-001A	1410-1	Tile	White/Gray Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-001B	1410-1	Mastic	Clear Yellow/Black Adhesive; Inhomogeneous	Trace <1% Chrysotile	100% Non-Fibrous
Total Asbestos: Trace <1%					
Unable to separate mastics					
15-04-02552-002A	1410-2	Tile	White/Gray Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-002B	1410-2	Mastic	Black Adhesive; Homogeneous	7% Chrysotile	93% Non-Fibrous
Total Asbestos: 7%					
15-04-02552-003A	1410-3	Tile	Beige Vinyl; Homogeneous	2% Chrysotile	98% Non-Fibrous
Total Asbestos: 2%					

# Environmental Hazards Services, L.L.C

Client Number: 200608  
 Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Report Number: 15-04-02552

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-003B	1410-3	Mastic	Black Adhesive; Homogeneous	6% Chrysotile	94% Non-Fibrous
				Total Asbestos: 6%	
15-04-02552-004A	1410-4	Tile		Did Not Analyze (Positive Stop)	
15-04-02552-004B	1410-4	Mastic		Did Not Analyze (Positive Stop)	
15-04-02552-005A	1410-5	Tile	Blue Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-005B	1410-5	Mastic	Black Adhesive; Homogeneous	5% Chrysotile	95% Non-Fibrous
				Total Asbestos: 5%	
15-04-02552-006A	1410-6	Tile	Blue Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-006B	1410-6	Mastic		Did Not Analyze (Positive Stop)	
15-04-02552-007A	1410-7	Linoleum	Gray/Beige Vinyl; Fibrous; Inhomogeneous	20% Chrysotile	80% Non-Fibrous
				Total Asbestos: 20%	
Chrysotile present in fibrous backing.					
15-04-02552-007B	1410-7	Mastic	Yellow Adhesive; Homogeneous	2% Chrysotile	98% Non-Fibrous
				Total Asbestos: 2%	
Possible contamination from fibrous backing.					



## Environmental Hazards Services, L.L.C

Client Number: 200608  
 Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Report Number: 15-04-02552

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-008A	1410-8	Linoleum		Did Not Analyze (Positive Stop)	
15-04-02552-008B	1410-8	Mastic		Did Not Analyze (Positive Stop)	
15-04-02552-009A	1410-9	Tile	Beige/Multi-Colored Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-009B	1410-9	Mastic	Yellow Adhesive; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-010A	1410-10	Tile	Beige/Multi-Colored Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-010B	1410-10	Mastic		Did Not Analyze (Quantity Not Sufficient)	
15-04-02552-011A	1410-11	Tile	Beige/Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-011B	1410-11	Mastic	Black/Yellow Adhesive; Inhomogeneous	NAD	5% Cellulose 95% Non-Fibrous
15-04-02552-012A	1410-12	Tile	Beige/Black Vinyl; Homogeneous	NAD	100% Non-Fibrous

## Environmental Hazards Services, L.L.C

Client Number: 200608

Report Number: 15-04-02552

Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-012B	1410-12	Mastic	Yellow Adhesive; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-013A	1410-13	Tile	Beige Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-013B	1410-13	Mastic	Black Adhesive; Homogeneous	6% Chrysotile	94% Non-Fibrous
				Total Asbestos: 6%	
15-04-02552-014A	1410-14	Tile	Beige Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-014B	1410-14	Mastic		Did Not Analyze (Positive Stop)	
15-04-02552-015	1410-15		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-016	1410-16		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-017	1410-17		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous

# Environmental Hazards Services, L.L.C

Client Number: 200608

Report Number: 15-04-02552

Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-018	1410-18		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-019	1410-19		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-020	1410-20		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-021	1410-21		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-022	1410-22		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-023	1410-23		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous
15-04-02552-024	1410-24		Beige Fibrous; White Paint; Inhomogeneous	NAD	65% Cellulose 20% Fibrous Glass 15% Non-Fibrous

## Environmental Hazards Services, L.L.C

Client Number: 200608

Report Number: 15-04-02552

Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-025A	1410-25	Cove Base	Dark Brown/Gray Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-025B	1410-25	Mastic	Cream Brittle; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-026A	1410-26	Cove Base	Black Vinyl; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-026B	1410-26	Mastic	Pale Yellow Adhesive; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-027	1410-27		Pale Yellow to Beige Brittle; Silver Foil; Inhomogeneous	NAD	10% Cellulose 90% Non-Fibrous
15-04-02552-028	1410-28		Pale Yellow to Beige Brittle; Silver Foil; Inhomogeneous	NAD	8% Cellulose 8% Fibrous Glass 92% Non-Fibrous
15-04-02552-029	1410-29		Pale Yellow to Beige Brittle; Silver Foil; Inhomogeneous	NAD	2% Cellulose 8% Fibrous Glass 90% Non-Fibrous
15-04-02552-030	1410-30		Black Adhesive; Homogeneous	NAD	100% Non-Fibrous

# Environmental Hazards Services, L.L.C

Client Number: 200608

Report Number: 15-04-02552

Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-031	1410-31		Black Adhesive; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-032	1410-32		Pale Gray Powdery; Brown Fibrous; Inhomogeneous	NAD	13% Cellulose 87% Non-Fibrous
15-04-02552-033	1410-33		Pale Gray Powdery; Brown Fibrous; Inhomogeneous	NAD	15% Cellulose 85% Non-Fibrous
15-04-02552-034	1410-34		White Chalky; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-035	1410-35		White Chalky; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-036	1410-36		White Chalky; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-037	1410-37		White Chalky; Homogeneous	NAD	100% Non-Fibrous
15-04-02552-038	1410-38		White Chalky; Homogeneous	NAD	100% Non-Fibrous

# Environmental Hazards Services, L.L.C

Client Number: 200608

Report Number: 15-04-02552

Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
15-04-02552-039	1410-39		Black Tar; Pliable Homogeneous	NAD	100% Non-Fibrous
15-04-02552-040	1410-40		Black Tar; Pliable Homogeneous	NAD	100% Non-Fibrous
15-04-02552-041	1410-41		Black Tar; Pliable Homogeneous	NAD	100% Non-Fibrous
15-04-02552-042	1410-42		Black Tar; Pliable Homogeneous	NAD	100% Non-Fibrous
15-04-02552-043	1410-43		Black Tar; Pliable; Tan Cementitious; Inhomogeneous	NAD	100% Non-Fibrous
15-04-02552-044	1410-44		Black Tar; Pliable; Tan Cementitious; Inhomogeneous	NAD	100% Non-Fibrous

# Environmental Hazards Services, L.L.C

Client Number: 200608  
Project/Test Address: 1410 Coulter Drive, NW; Roanoke, VA

Report Number: 15-04-02552

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
-------------------	----------------------	------------	-----------------------	----------	-----------------

QC Sample: 80-M22013-3, 72-M22010-3

QC Blank: SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method: EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst: Katherine Charles Harris

Reviewed By Authorized Signatory:



Tasha Eaddy  
QA/QC Clerk

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

\* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND: NAD = no asbestos detected



44 P2M

# Asbestos Chain-of-Custody

POSTIVE STOP

Environmental Hazards Services, LLC

www.leadlab.com 7469 Whitepine Rd  
 (800)347-4010 Richmond, VA  
 (804)275-4907 (fax) 23237

15-04-02552



Due Date:  
 04/24/2015  
 (Friday)  
 ER

*[Handwritten Signature]*

Company Name: ECS Mid-Atlantic, LLC Address: 7670 Enon Drive, Suite 101 City/State/Zip: Roanoke, VA 24019

Phone: (540) 362-2000 Fax: (540) 362-1202 E-mail: amoon@ecslimited.com Acct. Number: \_\_\_\_\_

Project Name / Testing Address: 1410 Coulter Drive, NW City/State (Required): Roanoke, VA

Collected by: Alexandra Moon Purchase Order Number: 8171

**Turn Around Times :** *If no TAT is specified, sample(s) will be processed and charged as 3-day TAT.*

1 - Day  2 - Day  3 - Day  Same Day (Must Call Ahead)  Weekend (Must Call Ahead)

No.	Client Sample ID	Date Collected	ASBESTOS							AIR				COMMENTS
			PLM	PLM Point Count 400	PLM Point Count 1000	PLM NY Protocol	PCM	TEM Chatfield (Bulk)	TEMAHERA (Air)	Time On	Time Off	Flow Rate (L/min)	Total Time (minutes)	
1	1410-1	4/17/2015	✓									("new" mens bath)	FT; 12x12 beige w/light trans/bw	3PS
2	1410-2	4/17/2015	✓									("new" mens bath)	FT; 12x12 beige w/light trans/bw	
3	1410-3	4/17/2015	✓									("old" 1st floor)	FT; 12x12 beige w/brown specks	
4	1410-4	4/17/2015	✓									("old" 1st floor)	FT; 12x12 beige w/brown specks	
5	1410-5	4/17/2015	✓										FT; 12x12 Blue; Water fountain	
6	1410-6	4/17/2015	✓										FT; 12x12 Blue; Water fountain	
7	1410-7	4/17/2015	✓										FT; 12x12 Terazzo Pattern	
8	1410-8	4/17/2015	✓										FT; 12x12 Terazzo Pattern	
9	1410-9	4/17/2015	✓										FT; 12x12 Beige w/color splotches	
10	1410-10	4/17/2015	✓										FT; 12x12 Beige w/color splotches	

Released by: Alexandra Moon Signature: Kathleen for Amoon Date/Time: 4/17/2015  
 Received by: Stone Signature: [Signature] Date/Time: 4/21/15

10F5





# Asbestos Chain-of-Custody

2552  
~ For Lab Use Only ~

Environmental Hazards Services, LLC

www.leadlab.com 7469 Whitepine Rd  
(800)347-4010 Richmond, VA  
(804)275-4907 (fax) 23237

POSTIVE STOP

Company Name: ECS Mid-Atlantic, LLC Address: 7670 Enon Drive, Suite 101 City/State/Zip: Roanoke, VA 24019  
Phone: (540) 362-2000 Fax: (540) 362-1202 E-mail: amoon@ecslimited.com Acct. Number: \_\_\_\_\_

Project Name / Testing Address: 1410 Coulter Drive, NW City/State (Required): Roanoke, VA  
Collected by: Alexandra Moon Purchase Order Number: 8171

**Turn Around Times :** *If no TAT is specified, sample(s) will be processed and charged as 3-day TAT.*  
 \_\_\_\_\_ 1 - Day \_\_\_\_\_ 2 - Day  3 - Day \_\_\_\_\_ Same Day (Must Call Ahead) \_\_\_\_\_ Weekend (Must Call Ahead)

No.	Client Sample ID	Date Collected	ASBESTOS							AIR				COMMENTS	
			PLM	PLM Point Count 400	PLM Point Count 1000	PLM NY Protocol	PCM	TEM Chatfield (Bulk)	TEMAHERA (Air)	Time On	Time Off	Flow Rate (L/min)	Total Time (minutes)		Volume (Total Liters)
1	1410-11	4/17/2015	✓											(basement) FT; 12x12 beige w/black specs	3PS
2	1410-12	4/17/2015	✓											(basement) FT; 12x12 beige w/black specs	3PS
3	1410-13	4/17/2015	✓											(women's bath) FT; 12x12 beige w/brown streaks	3PS
4	1410-14	4/17/2015	✓											(women's bath) FT; 12x12 beige w/brown streaks	3PS
5	1410-15	4/17/2015	✓											CT 2x2 pinhole punch	3PS
6	1410-16	4/17/2015	✓											CT 2x2 pinhole punch	3PS
7	1410-17	4/17/2015	✓											CT 2x4 pinhole fissure	3PS
8	1410-18	4/17/2015	✓											CT 2x4 pinhole fissure	3PS
9	1410-19	4/17/2015	✓											CT; 2x4 pinhole punch	3PS
10	1410-20	4/17/2015	✓											CT; 2x4 pinhole punch	3PS
Released by: Alexandra Moon			Signature: <i>Kathleen Stone</i>							Date/Time: 4/17/2015					
Received by: <i>Stone</i>			Signature: <i>Stone</i>							Date/Time: 4/21/15					



# Asbestos Chain-of-Custody

2552  
~ For Lab Use Only ~

Environmental Hazards Services, LLC

www.leadlab.com 7469 Whitepine Rd  
(800)347-4010 Richmond, VA  
(804)275-4907 (fax) 23237

POSTIVE STOP

Company Name: ECS Mid-Atlantic, LLC Address: 7670 Enon Drive, Suite 101 City/State/Zip: Roanoke, VA 24019  
Phone: (540) 362-2000 Fax: (540) 362-1202 E-mail: amoon@ecslimited.com Acct. Number: \_\_\_\_\_

Project Name / Testing Address: 1410 Coulter Drive, NW City/State (Required): Roanoke, VA  
Collected by: Alexandra Moon Purchase Order Number: 8171

**Turn Around Times :** *If no TAT is specified, sample(s) will be processed and charged as 3-day TAT.*  
 1 - Day     2 - Day     3 - Day     Same Day (Must Call Ahead)     Weekend (Must Call Ahead)

No.	Client Sample ID	Date Collected	ASBESTOS						AIR				COMMENTS	
			PLM	PLM Point Count 400	PLM Point Count 1000	PLM NY Protocol	PCM	TEM Chatfield (Bulk)	TEM AHIERA (Air)	Time On	Time Off	Flow Rate (L/min)		Total Time (minutes)
1	1410-21	4/17/2015	✓											CT; 2x4 pin hole } PS
2	1410-22	4/17/2015	✓											CT; 2x4 pin hole } PS
3	1410-23	4/17/2015	✓											CT; 2x4 1inch fissure and pin } PS
4	1410-24	4/17/2015	✓											CT; 2x4 1inch fissure and pin } PS
5	1410-25	4/17/2015	✓											Cove base w/mastic } PS
6	1410-26	4/17/2015	✓											Cove base w/mastic } PS
7	1410-27	4/17/2015	✓											pipe insulation sealant } PS
8	1410-28	4/17/2015	✓											pipe insulation sealant } PS
9	1410-29	4/17/2015	✓											pipe insulation sealant } PS
10														

Released by: Alexandra Moon Signature: Katherine Fox Date/Time: 4/17/2015  
 Received by: T Stone Signature: T Stone Date/Time: 4/21/15  
2015



# Asbestos Chain-of-Custody

2552

~ For Lab Use Only ~

Environmental Hazards Services, LLC  
 www.leadlab.com 7469 Whitepine Rd  
 (800)347-4010 Richmond, VA  
 (804)275-4907 ( fax) 23237

POSTIVE STOP

Company Name: ECS Mid-Atlantic, LLC Address: 7670 Enon Drive, Suite 101 City/State/Zip: Roanoke, VA 24019

Phone: (540) 362-2000 Fax: (540) 362-1202 E-mail: amoon@ecslimited.com Acct. Number: \_\_\_\_\_

Project Name / Testing Address: 1410 Coulter Drive, NW City/State (Required): Roanoke, VA

Collected by: Alexandra Moon Purchase Order Number: 8171

**Turn Around Times :** *If no TAT is specified, sample(s) will be processed and charged as 3-day TAT.*

1 - Day   
  2 - Day   
  3 - Day   
  Same Day (Must Call Ahead)   
  Weekend (Must Call Ahead)

No.	Client Sample ID	Date Collected	ASBESTOS							AIR			COMMENTS	
			PLM	PLM Point Count 400	PLM Point Count 1000	PLM NY Protocol	PCM	TEM Chatfield (Bulk)	TEM/HERA (AIF)	Time On	Time Off	Flow Rate (L/min)		Total Time (minutes)
1	1410-30	4/17/2015	✓										(blue box-wall)	black pipe tar wrap (Boiler room) } PS
2	1410-31	4/17/2015	✓										(blue box-wall)	black pipe tar wrap (Boiler room) } PS
3	1410-32	4/17/2015	✓											DW-wall } PS
4	1410-33	4/17/2015	✓											DW-wall } PS
5	1410-34	4/17/2015	✓											Joint Compound } PS Joint Compound } PS Joint Compound } PS Joint Compound } PS
6	1410-35	4/17/2015	✓											
7	1410-36	4/17/2015	✓											
8	1410-37	4/17/2015	✓											
9	1410-38	4/17/2015	✓											
10														
Released by: Alexandra Moon			Signature: <i>Kathryn Lee</i>							Date/Time: 4/17/2015				
Received by: <i>STONE</i>			Signature: <i>STONE</i>							Date/Time: 4/21/15				

*Kathryn Lee*  
*STONE*  
4/21/15



# Asbestos Chain-of-Custody

2552

~ For Lab Use Only ~

Environmental Hazards Services, LLC

www.leadlab.com      7469 Whitepine Rd  
 (800)347-4010      Richmond, VA  
 (804)275-4907 (fax)      23237

POSTIVE STOP

Company Name: ECS Mid-Atlantic, LLC      Address: 7670 Enon Drive, Suite 101      City/State/Zip: Roanoke, VA 24019

Phone: (540) 362-2000      Fax: (540) 362-1202      E-mail: amoon@ecslimited.com      Acct. Number: \_\_\_\_\_

Project Name / Testing Address: 1410 Coulter Drive, NW      City/State (Required): Roanoke, VA

Collected by: Alexandra Moon      Purchase Order Number: 8171

**Turn Around Times :**      *If no TAT is specified, sample(s) will be processed and charged as 3-day TAT.*

1 - Day     
  2 - Day     
  3 - Day     
  Same Day (Must Call Ahead)     
  Weekend (Must Call Ahead)

No.	Client Sample ID	Date Collected	ASBESTOS						AIR				COMMENTS	
			PLM	PLM Point Count 400	PLM Point Count 1000	PLM NY Protocol	PCM	TEM Chatfield (Bulk)	TEMAHERA (Air)	Time On	Time Off	Flow Rate (L/min)		Total Time (minutes)
1	1410-39	4/17/2015	✓											Exterior- Black siding liner
2	1410-40	4/17/2015	✓											Exterior- Black siding liner
3	1410-41	4/17/2015	✓											Exterior- Door Caulk
4	1410-42	4/17/2015	✓											Exterior- Door Caulk
5	1410-43	4/17/2015	✓											Exterior Window Caulk
6	1410-44	4/17/2015	✓											Exterior Window Caulk
7														
8														
9														
10														

Released by: Alexandra Moon      Signature: Katlyne Weir For      Date/Time: 4/17/2015

Received by: T Stone      Signature: T Stone      Date/Time: 4/21/15