



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

**Division of Facilities Construction and Management**

**DFCM**

## **STANDARD LOW BID PROJECT**

**May 24, 2007**

# **WEST JORDAN AASF AVIATION COMPLEX REMODEL**

## **UTAH NATIONAL GUARD WEST JORDAN, UTAH**

DFCM Project Number 07061480

HFS Architects  
1484 South State Street  
Salt Lake City, Utah 84115

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Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at <http://dfcm.utah.gov> or are available upon request from DFCM.

DFCM General Conditions dated May 25, 2005.

DFCM Application and Certification for Payment dated May 25, 2005.

Technical Specifications :

Drawings:

**The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at <http://dfcm.utah.gov>**

## NOTICE TO CONTRACTORS

Sealed bids will be received by the Division of Facilities Construction and Management (DFCM) for:

**WEST JORDAN AASF AVIATION COMPLEX REMODEL**  
**UTAH NATIONAL GUARD – WEST JORDAN, UTAH**  
**DFCM PROJECT NO: 07061480**

Bids will be in accordance with the Contract Documents that will be available at 4:00 PM on Thursday, May 24, 2007, and distributed in electronic format only on CDs from DFCM at the Wasatch Building at the Utah State Fairpark, approximately 155 North 1000 West, Salt Lake City, Utah and on the DFCM web page at <http://dfcm.utah.gov>. For questions regarding this project, please contact Wayne Smith, DFCM, at 801-550-6536. No others are to be contacted regarding this bidding process. The construction budget for this project is \$200,000.00.

A **mandatory** pre-bid meeting will be held at 9:00 AM on Wednesday, May 30, 2007 at 7602 South Airport Road (4500 West), West Jordan, Utah. All bidders wishing to bid on this project are required to attend this meeting.

Bids will be received until the hour of 1:30 PM on Wednesday, June 6, 2007 at the Wasatch Building at the Utah State Fairpark, approximately 155 North 1000 West, Salt Lake City, Utah. Refer to the map on the DFCM website for directions ([http://dfcm.utah.gov/downloads/fairpark\\_map.pdf](http://dfcm.utah.gov/downloads/fairpark_map.pdf)). Bids will be opened and read aloud in the Wasatch Building at the Utah State Fairpark. NOTE: Bids must be received at the Wasatch Building at the Utah State Fairpark by the specified time.

A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid.

The Division of Facilities Construction and Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of DFCM.

### DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT

Marla Workman, Contract Coordinator  
4110 State Office Building, Salt Lake City, Utah 84114

## PROJECT DESCRIPTION

This project consists of interior remodel of existing space as per drawings and specifications. Demolition of walls, electrical equipment, and mechanical equipment is also part of the scope of work.

Contractors wishing to submit bids for this project **MUST** be pre-qualified by DFCM to bid or **MUST** be on the DFCM General Contractor Short List for FY 2008.

To become pre-qualified to bid this project, contractors must submit the following documentation to DFCM, Utah State Fairpark, 1055 West 100 North no later than 4:00 PM Tuesday, May 29, 2007:

1. Statement of Qualification identifying a 3 – 5 year work history of previous State of Utah projects and/or similar projects to this particular project including demolition, structural, electrical, and mechanical work. Identify work experience and qualifications of key management and superintendent personnel.
2. A Management Plan of how this project would be managed and supervised from start to finish. Identify how work will proceed and how the schedule will be managed to meet the needs of the agencies occupying the facility during construction. This will be a key factor in the project because work must be completed while the building space is occupied and work will need to be coordinated closely between the agency's training schedule and the contractor's work schedule.

**PROJECT SCHEDULE**

<b>PROJECT NAME:</b>	<b>WEST JORDAN AASF AVIATION COMPLEX REMODEL UTAH NATIONAL GUARD – WEST JORDAN, UTAH</b>			
<b>DFCM PROJECT NO.</b>	<b>07061480</b>			
<b>Event</b>	<b>Day</b>	<b>Date</b>	<b>Time</b>	<b>Place</b>
Bidding Documents Available	Thursday	May 24, 2007	4:00 PM	Wasatch Building Utah State Fairpark Approx 155 North 1000 West Salt Lake City, UT and DFCM web site *
<b>Mandatory</b> Pre-bid Site Meeting	Wednesday	May 30, 2007	9:00 AM	7602 South Airport Rd (4500 West) West Jordan, UT
Last Day to Submit Questions	Friday	June 1, 2007	4:00 PM	Wayne Smith – DFCM E-mail <a href="mailto:wsmith@utah.gov">wsmith@utah.gov</a> Fax 801-538-8487
Prime Contractors Turn In Bid and Bid Bond	Wednesday	June 6, 2007	1:30 PM	Wasatch Building Utah State Fairpark Approx 155 North 1000 West Salt Lake City, UT **
Sub-contractor List Due	Thursday	June 7, 2007	1:30 PM	DFCM 4110 State Office Bldg SLC, UT Fax 801-538-3677
Substantial Completion Date	Tuesday	July 31, 1007		

\* **NOTE:** DFCM's web site address is <http://dfcm.utah.gov>

\*\* **Due to the ongoing construction on Capitol Hill and the anticipated shortage of parking during 2007, all bids will be received and opened at the Wasatch Building at the Utah State Fairpark. Refer to map on the DFCM web site for directions ([http://dfcm.utah.gov/downloads/fairpark\\_map.pdf](http://dfcm.utah.gov/downloads/fairpark_map.pdf))**



## BID FORM

NAME OF BIDDER \_\_\_\_\_ DATE \_\_\_\_\_

To the Division of Facilities Construction and Management  
4110 State Office Building  
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **WEST JORDAN AASF AVIATION COMPLEX REMODEL – UTAH NATIONAL GUARD – WEST JORDAN, UTAH – DFCM PROJECT NO. 07061480** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: \_\_\_\_\_

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

\_\_\_\_\_ DOLLARS (\$\_\_\_\_\_)

(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by **Tuesday, July 31, 2007**, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **\$250.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of \_\_\_\_\_

The undersigned Contractor's License Number for Utah is \_\_\_\_\_.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable 100% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization:

\_\_\_\_\_

(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

\_\_\_\_\_

Respectfully submitted,

\_\_\_\_\_

Name of Bidder

ADDRESS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Authorized Signature

# INSTRUCTIONS TO BIDDERS

## 1. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Invitation to Bid.

## 2. Bids

Before submitting a bid, each contractor shall carefully examine the Contract Documents, shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Invitation to Bid prior to the deadline for submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. **THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.**

If the bid bond security is submitted on a bid bond form other than DFCM's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. **NOTE: A cashier's check cannot be used as a substitute for a bid bond.**

## 3. Contract and Bond

The Contractor's Agreement will be in the form found in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the contract sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for subcontractors will be specified in the Supplementary General Conditions.

**4. Listing of Subcontractors**

Listing of Subcontractors shall be as summarized in the “Instructions and Subcontractor’s List Form”, which are included as part of these Contract Documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contracts for a period of up to three years.

**5. Interpretation of Drawings and Specifications**

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Project Manager a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addenda posted on DFCM’s web site at <http://dfcm.utah.gov>. Neither the DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

**6. Addenda**

Addenda will be posted on DFCM’s web site at <http://dfcm.utah.gov>. Contractors are responsible for obtaining information contained in each addendum from the web site. Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding.

**7. Award of Contract**

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

**8. DFCM Contractor Performance Rating**

As a contractor completes each DFCM project, DFCM, the architect/engineer and the using agency will evaluate project performance based on the enclosed “DFCM Contractor Performance Rating” form. The ratings issued on this project will not affect this project but may affect the award on future projects.

**9. Licensure**

The Contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

**10. Right to Reject Bids**

DFCM reserves the right to reject any or all Bids.

**11. Time is of the Essence**

Time is of the essence in regard to all the requirements of the Contract Documents.

**12. Withdrawal of Bids**

Bids may be withdrawn on written request received from bidder prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

**13. Product Approvals**

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E’s written approval will be in an issued addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

**14. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors**

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the contractor, subcontractor or sub-subcontractor.

**15. Debarment**

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by DFCM as part of the requirements for award of the Project.

**BID BOND**

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

**KNOW ALL PERSONS BY THESE PRESENTS:**

That \_\_\_\_\_ hereinafter referred to as the "Principal," and \_\_\_\_\_, a corporation organized and existing under the laws of the State of \_\_\_\_\_, with its principal office in the City of \_\_\_\_\_ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of \$ \_\_\_\_\_ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

**THE CONDITION OF THIS OBLIGATION IS SUCH** that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the \_\_\_\_\_ Project.

**NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH**, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

**PROVIDED, HOWEVER**, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

**IN WITNESS WHEREOF**, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

**DATED** this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**Principal's name and address (if other than a corporation):**

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

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

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

**Principal's name and address (if a corporation):**

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

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

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

(Affix Corporate Seal)

**Surety's name and address:**

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

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

Attorney-in-Fact (Affix Corporate Seal)

STATE OF \_\_\_\_\_ )  
 ) ss.  
COUNTY OF \_\_\_\_\_ )

On this \_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, personally appeared before me \_\_\_\_\_, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

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

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

Resides at: \_\_\_\_\_

NOTARY PUBLIC

**Agency:** \_\_\_\_\_  
**Agent:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_

Approved As To Form: May 25, 2005  
By Alan S. Bachman, Asst Attorney General



## INSTRUCTIONS AND SUBCONTRACTORS LIST FORM

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, on the following basis:

**PROJECTS UNDER \$500,000 - ALL SUBS \$20,000 OR OVER MUST BE LISTED**  
**PROJECTS \$500,000 OR MORE - ALL SUBS \$35,000 OR OVER MUST BE LISTED**

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- Bidder must list "Self" if performing work itself.

### **LICENSURE:**

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

### **BIDDER LISTING 'SELF' AS PERFORMING THE WORK:**

Any bidder that is properly licensed for the particular work and intends to perform that work itself in lieu of a subcontractor that would otherwise be required to be on the subcontractor list, must insert the term 'Self' for that category on the subcontractor list form. Any listing of 'Self' on the sublist form shall also include the amount allocated for that work.

### **'SPECIAL EXCEPTION':**

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A. Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

**INSTRUCTIONS AND SUBCONTRACTORS LIST FORM**  
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**GROUND FOR DISQUALIFICATION:**

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

**CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:**

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

- (1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
- (2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
- (3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
- (4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
- (5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
- (6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

**EXAMPLE:**

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #
ELECTRICAL	ABCD Electric Inc.	\$350,000.00	123456789000
LANDSCAPING	"Self"	300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: 350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

**PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.**



Division of Facilities Construction and

SUBCONTRACTORS LIST
FAX TO 801-538-3677

PROJECT TITLE: \_\_\_\_\_

Caution: You must read and comply fully with instructions.

Table with 4 columns: TYPE OF WORK, SUBCONTRACTOR, 'SELF' OR 'SPECIAL EXCEPTION', SUBCONTRACTOR BID AMOUNT, CONT. LICENSE #

We certify that:

- 1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

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

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

SIGNED BY: \_\_\_\_\_

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR DFCMS REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY DFCM. ATTACH A SECOND PAGE IF NECESSARY.

**CONTRACTOR'S AGREEMENT**

FOR:

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

THIS CONTRACTOR'S AGREEMENT, made and entered into this \_\_\_\_ day of \_\_\_\_\_, 20\_\_, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and \_\_\_\_\_, incorporated in the State of \_\_\_\_\_ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is \_\_\_\_\_.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at \_\_\_\_\_.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

**ARTICLE 1. SCOPE OF WORK.** The Work to be performed shall be in accordance with the Contract Documents prepared by \_\_\_\_\_ and entitled "\_\_\_\_\_."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

**ARTICLE 2. CONTRACT SUM.** The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of \_\_\_\_\_ DOLLARS AND NO CENTS (\$\_\_\_\_\_.00), which is the base bid, and which sum also includes the cost of a 100% Performance Bond and a 100%

CONTRACTOR'S AGREEMENT  
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Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

**ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY.** The Work shall be Substantially Complete by \_\_\_\_\_. Contractor agrees to pay liquidated damages in the amount of \$\_\_\_\_\_ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

**ARTICLE 4. CONTRACT DOCUMENTS.** The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Invitation to Bid, Instructions to Bidders/ Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

**ARTICLE 5. PAYMENT.** The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the Contractor requests payment and agrees to

safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

**ARTICLE 6. INDEBTEDNESS.** Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

**ARTICLE 7. ADDITIONAL WORK.** It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

**ARTICLE 8. INSPECTIONS.** The Work shall be inspected for acceptance in accordance with the General Conditions.

**ARTICLE 9. DISPUTES.** Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

**ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT.** This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

**ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF.** The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

**ARTICLE 12. INDEMNIFICATION.** The Contractor shall comply with the indemnification provisions of the General Conditions.

**ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT.** The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

**ARTICLE 14. RELATIONSHIP OF THE PARTIES.** The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

**ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT.** Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

**ARTICLE 16. ATTORNEY FEES AND COSTS.** Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.



**PERFORMANCE BOND**

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That \_\_\_\_\_ hereinafter referred to as the "Principal" and \_\_\_\_\_, a corporation organized and existing under the laws of the State of \_\_\_\_\_, with its principal office in the City of \_\_\_\_\_ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee," in the amount of \_\_\_\_\_ DOLLARS (\$) \_\_\_\_\_ for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, the Principal has entered into a certain written Contract with the Obligee, dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, to construct \_\_\_\_\_ in the County of \_\_\_\_\_, State of Utah, Project No. \_\_\_\_\_, for the approximate sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), which Contract is hereby incorporated by reference herein.

**NOW, THEREFORE**, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

**PROVIDED, HOWEVER**, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

**IN WITNESS WHEREOF**, the said Principal and Surety have signed and sealed this instrument this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

**WITNESS OR ATTESTATION:**

\_\_\_\_\_

**PRINCIPAL:**

\_\_\_\_\_

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

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

**WITNESS OR ATTESTATION:**

\_\_\_\_\_

**SURETY:**

\_\_\_\_\_

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

Attorney-in-Fact

STATE OF \_\_\_\_\_ )  
 ) ss.  
COUNTY OF \_\_\_\_\_ )

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, personally appeared before me \_\_\_\_\_, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

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

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

Resides at: \_\_\_\_\_

\_\_\_\_\_  
NOTARY PUBLIC

**Agency:** \_\_\_\_\_  
**Agent:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_

Approved As To Form: May 25, 2005  
By Alan S. Bachman, Asst Attorney General

**PAYMENT BOND**

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

**KNOW ALL PERSONS BY THESE PRESENTS:**

That \_\_\_\_\_ hereinafter referred to as the "Principal," and \_\_\_\_\_, a corporation organized and existing under the laws of the State of \_\_\_\_\_ authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of \_\_\_\_\_, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

**WHEREAS**, the Principal has entered into a certain written Contract with the Obligee, dated the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, to construct \_\_\_\_\_ in the County of \_\_\_\_\_, State of Utah, Project No. \_\_\_\_\_ for the approximate sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_), which contract is hereby incorporated by reference herein.

**NOW, THEREFORE**, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, 1953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

**PROVIDED, HOWEVER**, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

**IN WITNESS WHEREOF**, the said Principal and Surety have signed and sealed this instrument this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

**WITNESS OR ATTESTATION:**

\_\_\_\_\_

**PRINCIPAL:**

\_\_\_\_\_

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

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

**WITNESS OR ATTESTATION:**

\_\_\_\_\_

**SURETY:**

\_\_\_\_\_

By: \_\_\_\_\_ Attorney-in-Fact (Seal)

STATE OF \_\_\_\_\_ )  
 ) ss.  
COUNTY OF \_\_\_\_\_ )

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, personally appeared before me \_\_\_\_\_, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

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

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

Resides at: \_\_\_\_\_

\_\_\_\_\_  
NOTARY PUBLIC

**Agency:** \_\_\_\_\_  
**Agent:** \_\_\_\_\_  
**Address:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_

Approved As To Form: May 25, 2005  
By Alan S. Bachman, Asst Attorney General



CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT \_\_\_\_\_ PROJECT NO: \_\_\_\_\_
AGENCY/INSTITUTION \_\_\_\_\_

AREA ACCEPTED \_\_\_\_\_

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM - (Owner) accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at \_\_\_\_\_ (time) on \_\_\_\_\_ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

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

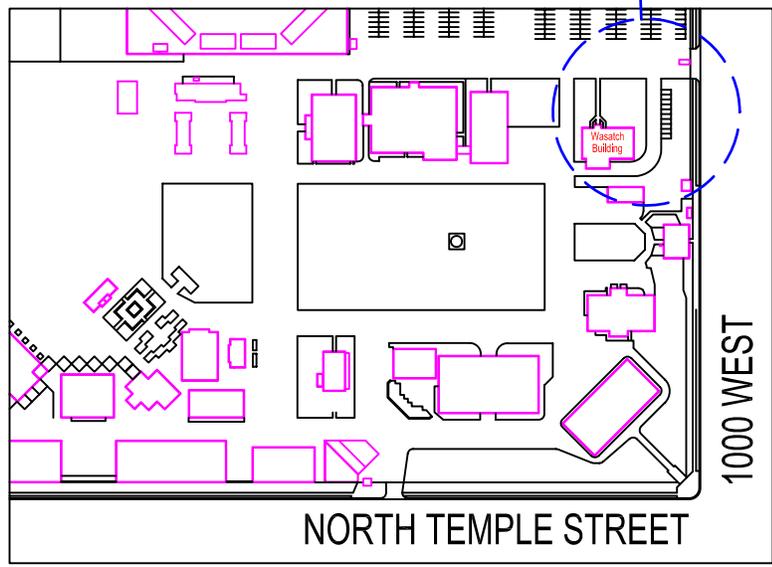
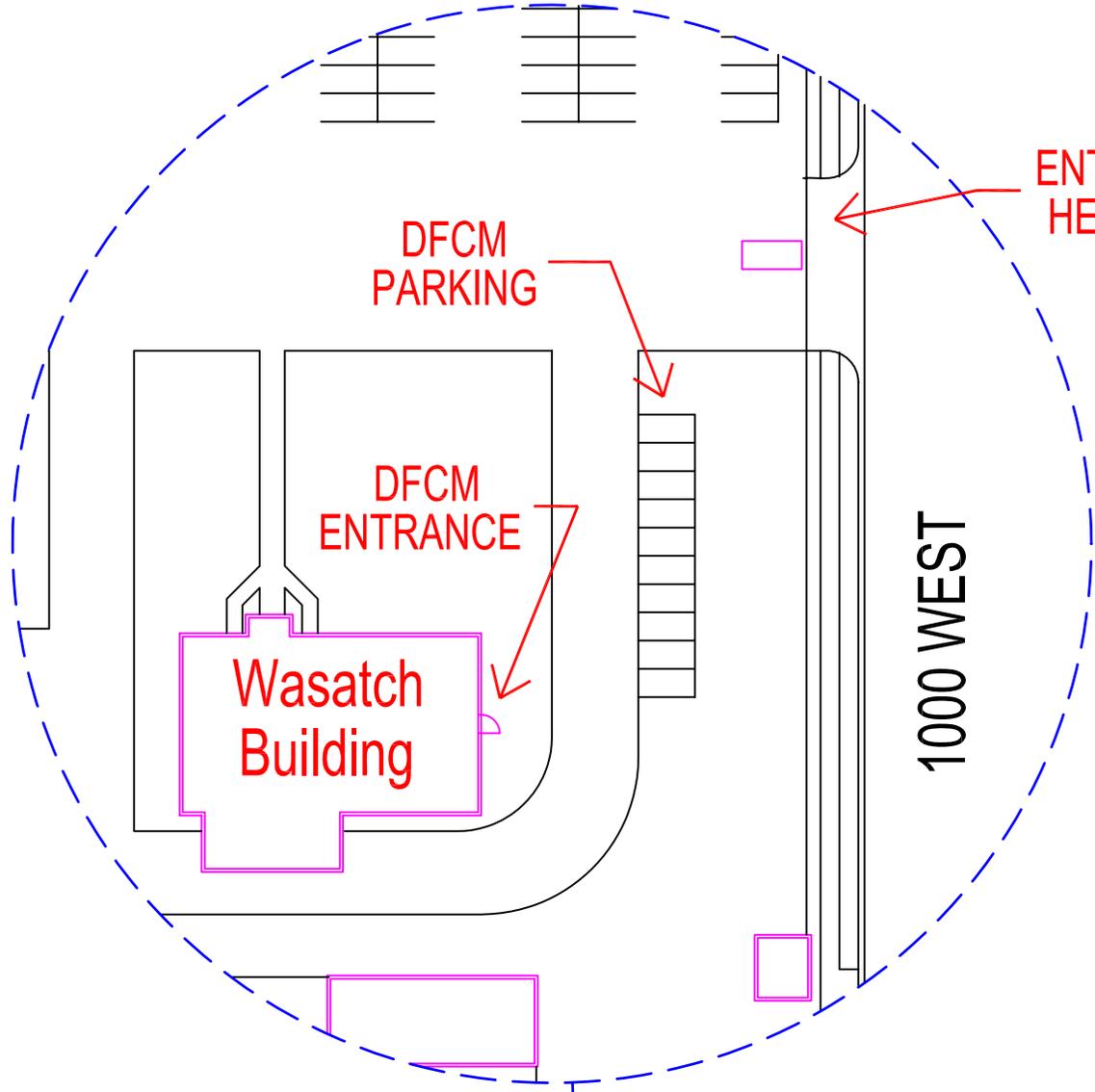
The Owner acknowledges receipt of the following closeout and transition materials:

- As-built Drawings O & M Manuals Warranty Documents Completion of Training Requirements

A list of items to be completed or corrected (Punch List) is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof. The amount of \_\_\_\_\_(Twice the value of the punch list work) shall be retained to assure the completion of the punch list work.

The Contractor shall complete or correct the Work on the list of (Punch List) items appended hereto within \_\_\_\_\_ calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: \$\_\_\_\_\_. If the list of items is not completed within the time allotted the Owner has the right to be compensated for the delays and/or complete the work with the help of independent contractor at the expense of the retained project funds. If the retained project funds are insufficient to cover the delay/completion damages, the Owner shall be promptly reimbursed for the balance of the funds needed to compensate the Owner.

by: \_\_\_\_\_
CONTRACTOR (include name of firm) (Signature) DATE
by: \_\_\_\_\_
A/E (include name of firm) (Signature) DATE
by: \_\_\_\_\_
USING INSTITUTION OR AGENCY (Signature) DATE
by: \_\_\_\_\_
DFCM (Owner) (Signature) DATE



UTAH STATE  
FAIR PARK



DFCM Temporary Location

HFSA #0715.01  
DFCM #07061480  
11 May 2007

# UTAH NATIONAL GUARD

## AASF Aviation Complex Interior Remodel

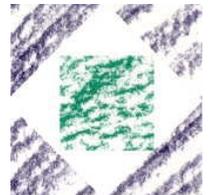


State of Utah—Department of Administrative Services

**DIVISION OF FACILITIES CONSTRUCTION  
AND MANAGEMENT**

4110 State Office Building / Salt Lake City, Utah 84114 / 538-3018

*HFS*Architects



ARCHITECTURE  
INTERIORS  
PLANNING

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**HFS Architects**  
**DFCM #07061480**  
**HFSA #0715.01**

**AASF AVIATION COMPLEX INTERIOR REMODEL**  
**Utah National Guard**

Architect

**HFS Architects**  
1484 S. State Street  
Salt Lake City, Utah 84115

P 801-596-0691  
F 801-596-0693

Structural Engineer

**Calder Richards Engineering**  
2015 South 1100 East  
Salt Lake City, Utah 84106

P 801-328-2726  
F 801-467-2495

Mechanical Engineer

**David L. Jensen & Associates**  
547 West 500 South  
Bountiful, Utah 84010

P 801-294-9299  
F 801-294-9399

Electrical Engineer

**Electrical Engineering & Lighting Design**  
1220 South 300 West  
Salt Lake City, Utah 84101

P 801-486-2222  
F 801-474-3353

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Work covered by the Contract Documents.
  - 2. Type of the Contract.
  - 3. Use of premises.
  - 4. Owner's occupancy requirements.
  - 5. Work restrictions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: AASF Aviation Complex Interior remodel.
  - 1. Project Location: Utah National Guard, 7602 Airport Road, West Jordan, Utah 84084
- B. Owner: DFCM, 4110 State Office Building, Salt Lake City, Utah 84114.
  - 1. Owner's Representative: Wayne Smith.
- C. Architect: HFS Architects, 1484 S. State Street, Salt Lake City, Utah 84115.
- D. The Work consists of the following:
  - 1. The Work includes demolition of existing interior walls, ceilings and electrical and mechanical demolition. New construction includes a new interior walls, doors, suspended acoustical ceiling system, mechanical and electrical systems.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract.

1.5 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits: Confine constructions operations to the construction limit line shown on the drawings.
  - 2. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
  - 3. Driveways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.6 OWNER'S OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: Owner will occupy the building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.7 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Owner not less than three days in advance of proposed utility interruptions

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
  - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  - 2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.9 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

- 1. Coordination Drawings.
- 2. Administrative and supervisory personnel.
- 3. Project meetings.

- B. Related Sections include the following:

- 1. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

- 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
- 3. Make adequate provisions to accommodate items scheduled for later installation.
- 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.
  9. Project closeout activities.

#### 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.
    - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  2. Sheet Size: At least **8-1/2 by 11 inches** but no larger than **30 by 42 inches**.
  3. Number of Copies: Submit six opaque copies of each submittal. Architect will return three.
  4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

1.6 PROJECT MEETINGS

- A. General: The Architect will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform subcontractors and suppliers and others involved, and individuals whose presence is required, of date and time of each meeting.
2. Minutes: The Architect will record significant discussions and agreements achieved.

- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
  - a. Tentative construction schedule.
  - b. Phasing.
  - c. Critical work sequencing and long-lead items.
  - d. Designation of key personnel and their duties.
  - e. Procedures for processing field decisions and Change Orders.
  - f. Procedures for requests for interpretations (RFIs).
  - g. Procedures for testing and inspecting.
  - h. Procedures for processing Applications for Payment.
  - i. Distribution of the Contract Documents.
  - j. Submittal procedures.
  - k. Preparation of Record Documents.
  - l. Use of the premises and existing building.
  - m. Work restrictions.
  - n. Owner's occupancy requirements.
  - o. Responsibility for temporary facilities and controls.
  - p. Construction waste management and recycling.
  - q. Parking availability.
  - r. Office, work, and storage areas.
  - s. Equipment deliveries and priorities.
  - t. First aid.
  - u. Security.

- v. Progress cleaning.
  - w. Working hours.
3. Minutes: Architect will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related requests for interpretations (RFIs).
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Review of mockups.
    - i. Possible conflicts.
    - j. Compatibility problems.
    - k. Time schedules.
    - l. Weather limitations.
    - m. Manufacturer's written recommendations.
    - n. Warranty requirements.
    - o. Compatibility of materials.
    - p. Acceptability of substrates.
    - q. Temporary facilities and controls.
    - r. Space and access limitations.
    - s. Regulations of authorities having jurisdiction.
    - t. Testing and inspecting requirements.
    - u. Installation procedures.
    - v. Coordination with other work.
    - w. Required performance results.
    - x. Protection of adjacent work.
    - y. Protection of construction and personnel.
  - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

- D. Progress Meetings: Architect will conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Requests for interpretations (RFIs).
      - 16) Status of proposal requests.
      - 17) Pending changes.
      - 18) Status of Change Orders.
      - 19) Pending claims and disputes.
      - 20) Documentation of information for payment requests.
  3. Minutes: Architect will record and distribute to Contractor the meeting minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

- a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01322 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Preconstruction videotapes.
- B. Related Sections include the following:
  - 1. Division 1 Section "Submittal Procedures" for submitting photographic documentation.
  - 2. Division 1 Section "Cut and Patch" for photographic documentation before selective demolition operations commence.
  - 3. Division 1 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.
- B. Videotape Format: Provide high-quality, 1/2-inch, VHS color videotape in full-size cassettes, T-90 minutes long.
  - 1. Tape quality shall be adequate to create photographic prints to be made from individual frames.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
  
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in filename for each image.
  - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference.
  
- C. Preconstruction Photographs: Before commencement of demolition and starting construction, take digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take fifteen photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

### 3.2 CONSTRUCTION VIDEOTAPES

- A. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each videotape, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
  
- B. Narration: Describe scenes on videotape by audio narration by microphone while videotape is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
  - 1. Confirm date and time at beginning and end of recording.
  
- C. Preconstruction Videotape: Before starting demolition, record videotape of Project site and surrounding properties from different vantage points.
  - 1. Flag construction limits before recording construction videotapes.
  - 2. Show existing conditions adjacent to Project site before starting the Work.
  - 3. Show protection efforts by Contractor.

END OF SECTION 01322

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
  - 2. Division 1 Section "Closeout Procedures" for submitting warranties.
  - 3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals- subject to a "Hold Harmless" agreement.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
  - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
  1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately **6 by 8 inches** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).
    - i. Number and title of appropriate Specification Section.
    - j. Drawing number and detail references, as appropriate.
    - k. Location(s) where product is to be installed, as appropriate.
    - l. Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
  2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Destination (To:).
    - d. Source (From:).
    - e. Names of subcontractor, manufacturer, and supplier.
    - f. Category and type of submittal.
    - g. Submittal purpose and description.
    - h. Specification Section number and title.
    - i. Drawing number and detail references, as appropriate.
    - j. Transmittal number, numbered consecutively.
    - k. Submittal and transmittal distribution record.
    - l. Remarks.
    - m. Signature of transmitter.
  2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked "Reviewed, no exceptions taken", or ."Furnish as corrected".
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "Reviewed, no exceptions taken", or ."Furnish as corrected" taken by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
1. Architect will require a "Hold Harmless" agreement.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operation and maintenance manuals.
    - k. Compliance with specified referenced standards.
    - l. Testing by recognized testing agency.
    - m. Application of testing agency labels and seals.
    - n. Notation of coordination requirements.
  4. Submit Product Data before or concurrent with Samples.
  5. Number of Copies: Submit five copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
    - m. Relationship to adjoining construction clearly indicated.
    - n. Seal and signature of professional engineer if specified.
    - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches** but no larger than **30 by 40 inches**.
  3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a. Number of Samples: Submit five sets of Samples. Architect will retain three Sample sets; remainder will be returned.
    - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product.
  2. Number and name of room or space.
  3. Location within room or space.
  4. Number of Copies: Submit five copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
    - a. Mark up and retain one returned copy as a Project Record Document.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- G. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- H. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."
- I. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

- J. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
  2. Number and title of related Specification Section(s) covered by subcontract.
  3. Drawing number and detail references, as appropriate, covered by subcontract.
  4. Number of Copies: Submit five copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
    - a. Mark up and retain one returned copy as a Project Record Document.

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Architect will not return copies.
  2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - 1. Name of evaluation organization.
  - 2. Date of evaluation.
  - 3. Time period when report is in effect.
  - 4. Product and manufacturers' names.
  - 5. Description of product.
  - 6. Test procedures and results.
  - 7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

- R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
  2. Required substrate tolerances.
  3. Sequence of installation or erection.
  4. Required installation tolerances.
  5. Required adjustments.
  6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

## 2.3 DELEGATED DESIGN

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit five copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
  1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

### **PART 3 - EXECUTION**

#### **3.1 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### **3.2 ARCHITECT'S / ACTION**

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Division 1 Section "Selective Demolition" for demolition of selected portions of the building.
  - 2. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  - 3. Products: List products to be used and firms or entities that will perform the Work.
  - 4. Dates: Indicate when cutting and patching will be performed.

5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

## 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
  1. Fire-suppression systems.
  2. Mechanical systems piping and ducts.
  3. Electrical wiring systems.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:
  1. Water, moisture, or vapor barriers.
  2. Piping, ductwork, vessels, and equipment.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

#### **3.3 PERFORMANCE**

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining

construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01731

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Demolition and removal of selected portions of a building or structure.
- 2. Repair procedures for selective demolition operations.

- B. Related Sections include the following:

- 1. Division 1 Section "Summary" for restrictions on use of the premises due to Owner or tenant occupancy.
- 2. Division 1 Section "Photographic Documentation" for documenting the everything within the project limit line, the state of the project site and the existing condition of adjacent structures and buildings prior to commencing demolition and construction of the project.
- 3. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
- 4. Division 15 Sections for demolishing, cutting, patching, or relocating mechanical items.
- 5. Division 16 Sections for demolishing, cutting, patching, or relocating electrical items.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

**1.4 MATERIALS OWNERSHIP**

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

**1.5 SUBMITTALS**

- A. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Locations of temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
  - 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Predemolition Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.
- F. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

**1.6 QUALITY ASSURANCE**

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review structural load limitations of existing structure.
  - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

## 1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
  - 1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## 1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

1. If possible, retain original Installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage original Installer or fabricator, engage another recognized experienced and specialized firm.
  - a. Matched-veneer woodwork.
  - b. Firestopping.
  - c. Wall covering.
  - d. HVAC enclosures, cabinets, or covers.

## **PART 2 - PRODUCTS**

### **2.1 REPAIR MATERIALS**

- A. Use repair materials identical to existing materials.
  1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 3.2 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
  - 1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.
  - 3. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
  - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

### 3.3 PREPARATION

- A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
- B. Pest Control: Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.
- C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  - 2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  - 3. Protect existing site improvements, appurtenances, and landscaping to remain.

4. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
- D. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings, and equipment that have not been removed.
- E. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- F. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
- G. Temporary Shoring: Provide and maintain interior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- 3.4 POLLUTION CONTROLS
- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
  2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

### 3.5 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 5. Maintain adequate ventilation when using cutting torches.
  - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 9. Dispose of demolished items and materials promptly.
  - 10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
- B. Existing Facilities: Comply with building manager's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- F. Resilient Floor Coverings, Resilient Base and Accessories: Remove floor coverings, base and adhesive according to recommendations in RFCI-WP and its Addendum.
1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

### 3.6 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching."
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.
- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.

3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

F. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### 3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 01732

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 2. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  2. Results of completed inspection will form the basis of requirements for Final Completion.

#### 1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
  2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report and warranty.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

- a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
  - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
  - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - g. Sweep concrete floors broom clean in unoccupied spaces.
  - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - j. Remove labels that are not permanent.
  - k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - m. Replace parts subject to unusual operating conditions.
  - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - p. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - r. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**HFS Architects**  
**DFCM #07061480**  
**HFS #0715.01**

**AASF AVIATION COMPLEX INTERIOR REMODEL**  
**Utah National Guard**

END OF SECTION 01770

**SECTION 01781 - PROJECT RECORD DOCUMENTS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Sections include the following:
  - 1. Division 1 Section "Closeout Procedures" for general closeout procedures.
  - 2. Divisions 2 through 16 Sections for specific requirements for Project Record Documents of the Work in those Sections.

**1.3 SUBMITTALS**

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one copy of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

**PART 2 - PRODUCTS**

**2.1 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an understandable drawing technique.
    - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

## 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

### 2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

### 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01781

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following metal fabrications:
  - 1. Rough hardware.
  - 2. Loose bearing and leveling plates.
  - 3. Miscellaneous framing and supports for the following:
    - a. Partial height wall bracing.
    - b. Applications where framing and supports are not specified in other sections.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 5 Section "Structural Steel" for structural steel framing system components.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for cast nosings, treads and thresholds, steel floor plate, paint products, and grout.
- C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- D. Samples representative of materials and finished products as may be requested by Architect.

- E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article. Certificates must be current.
- F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified. Fabrication shop must have a category II classification per AISC.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone re-certification in the last 12 months.

#### 1.5 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

### PART 2 - PRODUCTS

#### 2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A 36 (ASTM A 36M).

- C. Steel Tubing: Product type (manufacturing method) and as follows:
  - 1. Cold-Formed Steel Tubing: ASTM A 500.
    - a. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A 53.
- D. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.
  - 1. Black finish, unless otherwise indicated.
  - 2. Galvanized finish for exterior installations and where indicated.
- E. Gray-Iron Castings: ASTM A 48, Class 30.
- F. Malleable-Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).
- G. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

## 2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

## 2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).

- E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
- F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
  - 1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).
- I. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

#### 2.4 GROUT

- A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Nonshrink, Nonmetallic Grouts:
    - a. B-6 Construction Grout; W. R. Bonsal Co.
    - b. Diamond-Crete Grout; Concrete Service Materials Co.
    - c. Supreme; Cormix Construction Chemicals.
    - d. Sure-grip High Performance Grout; Dayton Superior Corp.
    - e. Euco N-S Grout; Euclid Chemical Co.
    - f. Five Star Grout; Five Star Products.
    - g. Vibropruf #11; Lambert Corp.
    - h. Crystex; L & M Construction Chemicals, Inc.
    - i. Masterflow 928 and 713; Master Builders Technologies, Inc.
    - j. Sealtight 588 Grout; W. R. Meadows, Inc.
    - k. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.
    - l. Kemset; The Spray-Cure Company.

#### 2.5 CONCRETE FILL

- A. Concrete Materials and Properties: Comply with requirements of Division 3 Section "Cast-in-Place Concrete" for normal-weight, ready-mix concrete with a minimum 28-day compressive strength of 4000 psi, unless higher strengths are indicated.

**2.6 FABRICATION, GENERAL**

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
  - 1. Temperature Change (Range): 100 deg F.
- D. Shear and punch metals cleanly and accurately. Remove burrs.
- E. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Remove sharp or rough areas on exposed traffic surfaces.
- G. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

## 2.7 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

## 2.8 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

## 2.9 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
    - a. Except as otherwise indicated, space anchors 24 inches o.c. and provide minimum anchor units in the form of steel straps 1-1/4 inches wide by 1/4 inch thick by 8 inches long.
- C. Galvanize miscellaneous framing and supports in the following locations:
  - 1. Exterior locations.
  - 2. Interior locations where indicated.

## 2.10 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and bars of profiles

shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices wherever possible.

- B. Provide cutouts, fittings, and anchorages as required to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.
- C. Galvanize miscellaneous steel trim in the following locations:
  - 1. Exterior locations.
  - 2. Interior locations where indicated.

## 2.11 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly.

## 2.12 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
  - 1. ASTM A 153 for galvanizing iron and steel hardware.
  - 2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

### 3.3 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or

shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.

1. Use nonshrink, metallic grout in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

#### **3.4 ADJUSTING AND CLEANING**

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a 2.0-mil minimum dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."
- C. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Rooftop equipment bases and support curbs.
  - 2. Wood blocking and nailers.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

## 2.2 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Nailers.
  2. Rooftop equipment bases and support curbs.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content and the following species:
  1. Hem-fir; WCLIB, or WWPA.
  2. Western woods; WCLIB or WWPA.
- C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

## 2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: **ASME B18.2.1**.
- F. Bolts: Steel bolts complying with **ASTM A 307, Grade A**; with **ASTM A 563** hex nuts and, where indicated, flat washers.

## 2.4 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.

#### **3.2 WOOD BLOCKING, AND NAILER INSTALLATION**

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

#### **3.3 PROTECTION**

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

**HFS Architects**  
**DFCM #07061480**  
**HFS #0715.01**

**AASF AVIATION COMPLEX INTERIOR REMODEL**  
**Utah National Guard**

END OF SECTION 06100

SECTION 07270 - FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes firestopping for the following:
  - a. Penetrations through fire-resistance-rated floor construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - b. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - c. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - a. Division 7 Section "Joint Sealants" for non-fire-resistive-rated joint sealants.
  - b. Division 15 Sections specifying ducts and piping penetrations.
  - c. Division 16 Sections specifying cable and conduit penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
  - a. Where firestop systems protect penetrations located outside of wall cavities.
  - b. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
  - c. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
  - d. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 sq. in.in overall cross-sectional area.

- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
  - a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - b. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
  - c. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

#### 1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
  - a. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
- C. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements.
- D. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

#### 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
  - a. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities

- having jurisdiction.
- b. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
    - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
    - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
  - c. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, as measured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
    - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
    - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. **Installer Qualifications:** Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
  - C. **Single-Source Responsibility:** Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
  - D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
  - E. **Coordinating Work:** Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
  - B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

## 1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

## 1.8 SEQUENCING AND SCHEDULING

- A. Notify Owner's inspection agency at least 1 week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.
- B. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

## PART 2 - PRODUCTS

### 2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
  - 1. Permanent forming/damming/backing materials including the following:
    - a. Semirefractory fiber (mineral wool) insulation.
    - b. Ceramic fiber.
    - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    - d. Fire-rated formboard.
    - e. Joint fillers for joint sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.
  - 4. Collars.
  - 5. Steel sleeves.

- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

## 2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.
- B. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- C. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Intumescent Latex Sealant:
    - a. Metacaulk 950, The RectorSeal Corporation.
    - b. Fire Barrier CP 25WB Caulk, 3M Fire Protection Products.
  - 2. Intumescent Putty:
    - a. Pensil 500 Intumescent Putty, General Electric Co.
    - b. Flame-Safe FSP1000 Putty, International Protective Coatings Corp.
    - c. Fire Barrier Moldable Putty, 3M Fire Protection Products.
  - 3. Intumescent Wrap Strips:
    - a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
    - b. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.
    - c. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
  - 4. Intumescent Pillows:
    - a. KBS Bags, International Protective Coatings Corp.
    - b. Approved equal.

## 2.3 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
  - a. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

- C. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
  - a. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated:
    - a. 50 percent movement in both extension and compression for a total of 100 percent movement.
    - b. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - a. Single-Component, Neutral-Curing, Silicone Sealant:
    - a. Dow Corning 790, Dow Corning Corp.
    - b. Dow Corning 795, Dow Corning Corp.
    - c. Silpruf, General Electric Co.
    - d. Ultraglaze, General Electric Co.
    - e. 864, Pecora Corp.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
  - a. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
  - b. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
  - c. Remove laitance and form release agents from concrete.

- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

### 3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
  - a. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
  - b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  - c. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing

begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

### 3.5 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 07270

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes joint sealants for the following locations:

1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
  - a. Joints as indicated.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data from manufacturers for each joint sealant product required.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- E. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.
- F. Product test reports for each type of joint sealants indicated, evidencing compliance with requirements specified.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
  - 2. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

#### 1.7 SEQUENCING AND SCHEDULING

- A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

## 2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
  1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.
- B. Products: Subject to compliance with requirements, provide one of the products specified in each Elastomeric Joint Sealant Data Sheet.

## 2.3 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
  2. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 g/cc per ASTM C 1083.
  3. Any material indicated above.
- C. Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, capable of remaining resilient at temperatures down to 26 deg. F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

## 2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer

to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.
- D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
  - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    - a. Do not leave gaps between ends of joint fillers.
    - b. Do not stretch, twist, puncture, or tear joint fillers.
    - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
- E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
  - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
    - a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 ELASTOMERIC JOINT SEALANT DATA SHEET

- A. Elastomeric Joint Sealant Designation: Acrylic-Emulsion Sealant
  1. Base Polymer: Acrylic -Emulsion Sealant.
  2. Type: S (single component).
  3. Grade: NS (nonsag).
  4. Class: 25.
  5. Use Related to Exposure: NT (nontraffic).
  6. Uses Related to Joint Substrates: G, A, and, as applicable to joint substrates indicated
  7. Products:
    - a. "AC-20," Pecora Corp.
    - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
    - c. "Tremco Acrylic Latex 834," Tremco, Inc.

3.7 JOINT SEALANT SCHEDULE

JOINT SEALERS	DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS TYPICALLY APPLIED*.
Acrylic-Emulsion Sealant	Interior joints in field-painted vertical and overhead surfaces at perimeter of hollow metal door and window frames; in gypsum drywall, concrete, and concrete masonry; and all other interior joints not indicated otherwise.

END OF SECTION 07920

**SECTION 08110 - STEEL DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section Includes:

- 1. Standard hollow metal doors and frames.

- B. Related Sections

- 1. Division 4 Section "Unit Masonry Assemblies" for embedding anchors for hollow metal work into masonry construction.
- 2. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
- 3. Division 9 Sections "Painting" for field painting hollow metal doors and frames.

**1.3 DEFINITIONS**

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door design.
  - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.
  - 5. Details of each different wall opening condition.
  - 6. Details of anchorages, joints, field splices, and connections.
  - 7. Details of accessories.

8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than **3 by 5 inches**.
2. For the following items, prepared on Samples about **12 by 12 inches** to demonstrate compliance with requirements for quality of materials and construction:

- a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
- b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

## 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum **4-inch**-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum **1/4-inch** space between each stacked door to permit air circulation.

## 1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benchmark; a division of Therma-Tru Corporation.
  - 2. Deansteel Manufacturing Company, Inc.
  - 3. Habersham Metal Products Company.
  - 4. Kewanee Corporation (The).
  - 5. Mesker Door Inc.
  - 6. Pioneer Industries, Inc.
  - 7. Steelcraft; an Ingersoll-Rand company.
  - 8. Windsor Republic Doors.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum **A40** metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), **40Z** coating designation; mill phosphatized.
  - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

- G. Grout: ASTM C 476, except with a maximum slump of **4 inches**, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with **6- to 12-lb/cu. ft.** density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for **15-mil** dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 2.3 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
  - 1. Fabricate frames with mitered or coped corners.
  - 2. Fabricate frames as full profile welded unless otherwise indicated.
  - 3. Frames for Level 2 Steel Doors: **0.053-inch-** thick steel sheet.
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

### 2.4 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than **0.042 inch** thick, with corrugated or perforated straps not less than **2 inches** wide by **10 inches** long; or wire anchors not less than **0.177 inch** thick.
  - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than **0.042 inch** thick.
  - 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
  - 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum **3/8-inch-** diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than **0.042 inch** thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
  - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than **2-inch** height adjustment. Terminate bottom of frames at finish floor surface.

**2.5 HOLLOW METAL PANELS**

- A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

**2.6 ACCESSORIES**

- A. Grout Guards: Formed from same material as frames, not less than **0.016 inch** thick.

**2.7 FABRICATION**

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 .
- C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  - 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than **18 inches** from top and bottom of frame. Space anchors not more than **32 inches** o.c. and as follows:
      - 1) Two anchors per jamb up to **60 inches** high.
      - 2) Three anchors per jamb from **60 to 90 inches** high.
      - 3) Four anchors per jamb from **90 to 120 inches** high.
      - 4) Four anchors per jamb plus 1 additional anchor per jamb for each **24 inches** or fraction thereof above **120 inches** high.
    - b. Stud-Wall Type: Locate anchors not more than **18 inches** from top and bottom of frame. Space anchors not more than **32 inches** o.c. and as follows:
      - 1) Three anchors per jamb up to **60 inches** high.
      - 2) Four anchors per jamb from **60 to 90 inches** high.
      - 3) Five anchors per jamb from **90 to 96 inches** high.

- 4) Five anchors per jamb plus 1 additional anchor per jamb for each **24 inches** or fraction thereof above **96 inches** high.
- 5) Two anchors per head for frames above **42 inches** wide and mounted in metal-stud partitions.
  - c. Compression Type: Not less than two anchors in each jamb.
  - d. Postinstalled Expansion Type: Locate anchors not more than **6 inches** from top and bottom of frame. Space anchors not more than **26 inches** o.c.
6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
  - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
  1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8 .
  2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
  3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.

## 2.8 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
  1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
  - 1. Squareness: Plus or minus **1/16 inch**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus **1/16 inch**, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus **1/16 inch**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus **1/16 inch**, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
  - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-protection-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable glazing stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.

- e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
  4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  5. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
  6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
  9. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus **1/16 inch**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus **1/16 inch**, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus **1/16 inch**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus **1/16 inch**, measured at jambs at floor.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.

- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08110

## SECTION 08211 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A.

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with wood-veneer, faces.
2. Factory finishing flush wood doors.

#### 1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:

1. Faces of Factory-Finished Doors: Show the full range of colors available for stained finishes.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

#### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
  1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UBC Standard 7-2.
  1. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.
- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
  - a. Solid-Core Interior Doors: Life of installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Flush Wood Doors:
    - a. Algoma Hardwoods Inc.
    - b. Buell Door Company.
    - c. Chappell Door Co.
    - d. Eggers Industries; Architectural Door Division.
    - e. GRAHAM Manufacturing Corp.
    - f. Haley Brothers, Inc.
    - g. Ideal Wood Products, Inc.
    - h. IPIK Door Company.
    - i. Mohawk Flush Doors, Inc.
    - j. Oshkosh Architectural Door Co.
    - k. VT Industries Inc.
    - l. Weyerhaeuser Company.

### 2.2 DOOR CONSTRUCTION, GENERAL

- A. Adhesives: Do not use adhesives containing urea formaldehyde.
- B. Doors for Transparent Finish:
  1. Grade: Premium, with Grade AA faces.
  2. Species and Cut: Red oak, plain sliced.
  3. Match between Veneer Leaves: Book match.
  4. Assembly of Veneer Leaves on Door Faces: Balance match.
  5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
  6. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 20 feet or more.
  7. Stiles: Same species as faces.

### 2.3 SOLID-CORE DOORS

- A. Particleboard Cores: Comply with the following requirements:
  - 1. Particleboard: ANSI A208.1, Grade LD-2.
    - a. Use particleboard made with binder containing no urea-formaldehyde resin.
  - 2. Provide doors with either glued-block or structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated.
- B. Interior Veneer-Faced Doors:
  - 1. Core: Particleboard.
  - 2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
- C. Fire-Rated Doors:
  - 1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
  - 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows:
    - a. 5-inch top-rail blocking.
    - b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
    - c. 5-inch midrail blocking, in doors indicated to have armor plates.
    - d. 4-1/2-by-10-inch lock blocks 5-inch midrail blocking, in doors indicated to have exit devices.
  - 3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.

## 2.4 FABRICATION

- A. Fabricate doors in sizes indicated for Project-site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
  - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

## 2.5 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory.
- C. Transparent Finish:
  1. Grade: Premium.
  2. Finish: AWI System TR-6 catalyzed polyurethane.
  3. Finish: Manufacturer's standard finish with performance comparable to AWI System TR-6 catalyzed polyurethane .
  4. Staining: As selected by Architect from manufacturer's full range.
  5. Effect: Open-grain finish.
  6. Sheen: Satin.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
  1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
  1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08211

SECTION 08711 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware for the following:
    - a. Swinging doors.
    - b. Other doors to the extent indicated.
- B. Related Sections include the following:
  - 1. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
- C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

- a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.
3. Content: Include the following information:
  - a. Type, style, function, size, label, hand, and finish of each door hardware item.
  - b. Manufacturer of each item.
  - c. Fastenings and other pertinent information.
  - d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
  - e. Explanation of abbreviations, symbols, and codes contained in schedule.
  - f. Mounting locations for door hardware.
  - g. Door and frame sizes and materials.
  - h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
    - 1) Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.
  1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" Article.
  1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, indicating current products comply with requirements.
- F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.
- G. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. **Installer Qualifications:** An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
  
- B. **Supplier Qualifications:** Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
  - 1. **Electrified Door Hardware Supplier Qualifications:** An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
    - a. **Engineering Responsibility:** Prepare data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
  - 2. **Scheduling Responsibility:** Preparation of door hardware and keying schedules.
  
- C. **Architectural Hardware Consultant Qualifications:** A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
  
- D. **Source Limitations:** Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that are listed to perform electrical modifications, by a testing and inspecting agency acceptable to authorities having jurisdiction, are acceptable.
  
- E. **Regulatory Requirements:** Comply with provisions of the following:
  - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1, as follows:
    - a. **Handles, Pulls, Latches, Locks, and other Operating Devices:** Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b. **Door Closers:** Comply with the following maximum opening-force requirements indicated:
      - 1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      - 2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - c. **Thresholds:** Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:
  - a. Latches, Locks, and Exit Devices: Not more than 15 lbf 67 N to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
  - b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
  - c. Thresholds: Not more that 1/2 inch high.

F. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: Test at atmospheric pressure.

G. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

## 1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. WARRANTY

C. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- D. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of operators and door hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- E. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
- F. Warranty Period for Manual Closers: 10 years from date of Substantial Completion.

#### 1.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

#### 1.8 EXTRA MATERIALS

- A. Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Door Hardware: one each passage latch sets, keyed lock sets, lock cylinder

### PART 2 - PRODUCTS

#### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, and the Door Hardware Schedule at the end of Part 3.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products, products equivalent in function and comparable in quality to named products complying with BHMA standard referenced.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

## 2.2 HINGES AND PIVOTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Hinges:

- a. Baldwin Hardware Corporation (BH).
- b. Bommer Industries, Inc. (BI).
- c. Hagger Companies (HAG).
- d. Lawrence Brothers, Inc. (LB).
- e. McKinney Products Company; Div. of ESSEX Industries, Inc. (MCK).
- f. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
- g. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

B. Standards: Comply with the following:

1. Butts and Hinges: BHMA A156.1.
2. Template Hinge Dimensions: BHMA A156.7.

C. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

D. Hinge Weight: Unless otherwise indicated, provide the following:

1. Doors with Closers: Antifriction-bearing hinges.
2. Interior Doors: Standard-weight hinges.

E. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges: Steel, with steel pin.
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

- F. Hinge Options: Comply with the following where indicated in the Door Hardware Schedule or on Drawings:
  - 1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the following applications:
    - a. Outswinging corridor doors with locks.
  - 2. Corners: Square.
  
- G. Fasteners: Comply with the following:
  - 1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
  - 2. Wood Screws: For wood doors and frames.
  - 3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
  - 4. Screws: Phillips flat-head screws; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

## 2.3 LOCKS AND LATCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Mechanical Locks and Latches:
    - a. Schlage (no substitutions- matching existing system)
  
- B. Standards: Comply with the following:
  - 1. Bored Locks and Latches: BHMA A156.2.
  
- C. Bored Locks: BHMA Grade 1; Series 4000.
  
- D. Certified Products: Provide door hardware listed in the following BHMA directories:
  - 1. Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
  
- E. Lock Trim: Comply with the following:
  - 1. Lever: Wrought, forged, or cast.
  - 2. Escutcheon (Rose): Wrought, forged, or cast.
  - 3. Dummy Trim: Match lever lock trim and escutcheons.
  - 4. Lockset Designs: Provide the lockset design designated below or, if sets are provided by another manufacturer, provide designs that match those designated:

- F. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
  - 1. Bored Locks: BHMA A156.2
- G. Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  - 1. Bored Locks: Minimum 1/2-inch latchbolt throw.
- H. Backset: 2-3/4 inches, unless otherwise indicated.

#### 2.4 CYLINDERS AND KEYING

- A. Owner will provide ASSA cylinders for locksets.

#### 2.5 STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

#### 2.6 CLOSERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Surface-Mounted Closers:
    - a. LCN Closers; an Ingersoll-Rand Company (LCN). (required to match existing bldg.)
- C. Standards: Comply with the following:
  - 1. Closers: BHMA A156.4.
- D. Surface Closers: BHMA Grade 1
- E. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
- F. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of

use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

## 2.7 PROTECTIVE TRIM UNITS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Metal Protective Trim Units:
    - a. Baldwin Hardware Corporation (BH).
    - b. Hager Companies (HAG).
    - c. Ives: H. B. Ives (IVS).
    - d. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
    - e. Rockwood Manufacturing Company (RM).
    - f. Triangle Brass Manufacturing Company, Inc. (TBM).
- C. Standard: Comply with BHMA A156.6.
- D. Materials: Fabricate protection plates from the following:
  - 1. Stainless Steel: 0.050 inch thick; beveled top and 2 sides.
- E. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.
- F. Furnish protection plates sized 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in Door Hardware Schedule.

## 2.8 STOPS AND HOLDERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Baldwin Hardware Corporation (BH).
  - 2. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
  - 3. Hager Companies (HAG).
  - 4. Ives: H. B. Ives (IVS).
  - 5. LCN Closers; an Ingersoll-Rand Company (LCN).
  - 6. Norton Door Controls; Div. of Yale Security Inc. (NDC).
  - 7. NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
  - 8. Rockwood Manufacturing Company (RM).
  - 9. Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
  - 10. Triangle Brass Manufacturing Company, Inc. (TBM).

- B. Standards: Comply with the following:
  - 1. Stops and Bumpers: BHMA A156.16.
  - 2. Mechanical Door Holders: BHMA A156.16.
  - 3. Electromagnetic Door Holders: BHMA A156.15.
  - 4. Combination Overhead Holders and Stops: BHMA A156.8.
  - 5. Door Silencers: BHMA A156.16.
- C. Stops and Bumpers: BHMA Grade 1.
- D. Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
  - 1. Where floor or wall stops are not appropriate, provide overhead holders.

## 2.9 FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  - 2. Steel Machine or Wood Screws: For the following fire-rated applications:
    - a. Mortise hinges to doors.
    - b. Strike plates to frames.
    - c. Closers to doors and frames.
  - 3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:

- a. Surface hinges to doors.
  - b. Closers to doors and frames.
  - c. Surface-mounted exit devices.
4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
  5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

## 2.10 FINISHES

- A. Standard: Comply with BHMA A156.18.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
  1. BHMA 626: Satin chromium plated over nickel, over brass or bronze base metal.
  2. BHMA 630: Satin stainless steel, over stainless-steel base metal.
  3. BHMA 652: Satin chromium plated over nickel, over steel base metal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

### 3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Key Control System: Comply with Utah National Guard system.

### 3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

### 3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

- 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- 3. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point **3 inches** from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

- 1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
- 2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
- 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

**3.6 CLEANING AND PROTECTION**

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

**3.7 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes.

**3.8 HARDWARE SCHEDULE**

- A. General: Provide hardware for each door to comply with requirements of Section "Door Hardware," hardware set numbers indicated in door symbol, and in the following schedule of hardware sets.
  - 1. Hardware sets indicate quantity, item, manufacturer and product designation, size, and finish or color, as applicable.

**HARDWARE SCHEDULE**

NO.	QTY.	ITEM	MFG	MODEL	STYLE/SIZE	FINISH
<b>01</b>		Office (non rated)				
	3 Ea	Hinges	Hager	AB700	4 ½ "x 4 ½ "	26D
	1 Ea	Lockset	Corbin Russwin	CL3361	Newport	26D
	1 Ea	Stop	Rockwood	403		26D

END OF SECTION 08711

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Nonload-bearing steel framing members for gypsum board assemblies.
  - 2. Repairs to original gypsum board assemblies

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

- C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
  - 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

#### 1.8 PROJECT CONDITIONS

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.
- B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F. For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F for 48 hours before application and continuously after until dry. Do not exceed 95 deg F when using temporary heat sources.
  - 1. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Framing and Furring:
  - a. Consolidated Systems, Inc.
  - b. Dale Industries, Inc.
  - c. Dietrich Industries, Inc.
  - d. Marino/Ware (formerly Marino Industries Corp.).
  - e. National Gypsum Co.; Gold Bond Building Products Division
  - f. Unimast, Inc.
  
2. Gypsum Board and Related Products:
  - a. Domtar Gypsum.
  - b. Georgia-Pacific Corp.
  - c. Georgia-Pacific Corp.
  - d. National Gypsum Co.; Gold Bond Building Products Division.
  - e. United States Gypsum Co.

## 2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components complying with ASTM C 754 for conditions indicated.
  1. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch thick.
  2. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch diameter.
    - a. Flat Hangers: Mild steel and zinc coated or protected with rust-inhibitive paint.
  3. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch- wide flanges, and as follows:
    - a. Carrying Channels: 2 inches deep, 590 lb/1000 feet, unless otherwise indicated.
    - b. Furring Channels: 3/4 inch deep, 300 lb/1000 feet, unless otherwise indicated.
    - c. Finish: ASTM A 653, G 60 (ASTM A 653M, Z 180) hot-dip galvanized coating for framing for exterior soffits and where indicated.
  4. Steel Studs for Furring Channels: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
    - a. Thickness: 20 gage, unless otherwise indicated, except at door jambs where 16 gage is required.
    - b. Depth: 3-5/8 inches and 6 inches unless otherwise indicated.
    - c. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.
  5. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth of 7/8 inch, and minimum thickness of base (uncoated) metal as follows:

- a. Thickness: 25 gage, unless otherwise indicated.
- b. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.

## 2.3 STEEL FRAMING FOR WALLS, PARTITIONS AND SOFFITS

- A. General: Provide steel framing members complying with the following requirements:
1. Protective Coating: Manufacturer's standard corrosion-resistant coating.
  2. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch-wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
    - a. Thickness: 20 gage, unless otherwise indicated.
    - b. Thickness: 16 gage, as follows:
      1. For jamb studs at doors and other openings, continue to structure above.
    - c. Depth interior: 3-5/8 and 6 inches at interior, unless otherwise indicated.
  3. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness of base (uncoated) metal as follows:
    - a. Thickness: 25 gage, unless otherwise indicated.
    - b. Depth: 7/8 inch.
  4. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
    - a. Thickness: 0.027 inch unless indicated otherwise.
  6. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

## 2.4 GYPSUM BOARD PRODUCTS

- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches.
  2. Gypsum Wallboard: ASTM C 36 and as follows:
    - a. Type: Regular for vertical surfaces, unless otherwise indicated.

- b. Type: Type X where required for fire-resistance-rated assemblies.
- c. Type: Sag-resistant type for ceiling surfaces.
- d. Edges: Tapered and featured (rounded or beveled) for prefilling.
- e. Thickness: 5/8 inch, unless otherwise indicated.

## 2.5 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
  - 1. Material: Formed metal complying with the following requirement:
    - a. Steel sheet zinc coated by hot-dip process or rolled zinc.
    - b. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
      - 1. Cornerbead on outside corners, unless otherwise indicated.
      - 2. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
  - 1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
- C. Setting-Type Joint Compounds for Gypsum Board: Factory-packaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
  - 1. Where setting-type joint compounds are indicated as a taping compound only or for taping and filling only, use formulation that is compatible with other joint compounds applied over it.
  - 2. For prefilling gypsum board joints, use formulation recommended by gypsum board manufacturer.
  - 3. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
  - 4. For topping compound, use sandable formulation.
- D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
  - 1. Ready-Mixed Formulation: Factory-mixed product.
    - a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.

- b. Topping compound formulated for fill (second) and finish (third) coats.
- c. All-purpose compound formulated for both taping and topping compounds.

## 2.7 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
  - 1. Steel drill screws complying with ASTM C 1002 for the following applications:
    - a. Fastening gypsum board to steel members less than 0.033 inch thick.
  - 2. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

### 3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
  - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
  - 2. Where partition framing and wall furring abut structure, except at floor.
    - a. Install deflection track top runner to attain lateral support and avoid axial loading.
  - 3. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

### 3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
  - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
  - 1. Cut studs 1/2 inch short of full height to provide perimeter relief.
- D. Terminate partition framing 6" above suspended ceilings where indicated.
- E. Install steel studs and furring in sizes and at spacings indicated.
  - 1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- G. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- H. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
  - 1. Install 2 studs at each jamb, unless otherwise indicated.
  - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
  - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof

structure above.

- I. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

### 3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.
- E. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
  1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft.in area.
  2. Fit gypsum panels around ducts, pipes, and conduits.
  3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- I. Isolate perimeter of nonload-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Space fasteners in gypsum panels according to referenced gypsum board application and

finishing standard and manufacturer's recommendations.

1. Space screws a maximum of 12 inches o.c. for vertical applications.

### 3.6 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:

1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels **vertically** (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
3. Single-Layer Fastening Methods: Apply gypsum panels to supports with screws.

### 3.7 INSTALLING TRIM ACCESSORIES

- A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.
- B. Install cornerbead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

### 3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.
- D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.

2. Level 2 where panels form substrates for tile and where indicated.
3. Level 4 for gypsum board surfaces, unless otherwise indicated.

- E. Use one of the following joint compound combinations as applicable to the finish levels specified:
1. Embedding and First Coat: Setting-type joint compound. Fill (Second) Coat: Setting-type joint compound. Finish (Third) Coat: Sandable, setting-type joint compound.
  2. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- F. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.
- G. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.
- H. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

### 3.9 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09255

**SECTION 09511 - ACOUSTICAL PANEL CEILINGS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes ceilings composed of acoustical panels and exposed suspension systems.

**1.3 SUBMITTALS**

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Samples for initial selection in the form of manufacturer's color charts consisting of actual acoustical panels or sections of panels and sections of suspension system members showing the full range of colors, textures, and patterns available for each ceiling assembly indicated.
- D. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
  - 1. 6-inch- square samples of each acoustical panel type, pattern, and color.
  - 2. Full-size samples of each acoustical panel type, pattern, and color.
  - 3. Set of 12-inch- long samples of exposed suspension system members, including moldings, for each color and system type required.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

**1.4 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

- B. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

#### 1.6 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

#### 1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

#### 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
  - 2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

### PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, products that may be incorporated in the Work include:

Non-Fire Resistance-Rated, 2' x 2' panels:

3/4" "Symphony m" with reveal edge by Capaul, Ultima by Armstrong, or Mars by USG.

## 2.2 ACOUSTICAL PANELS, GENERAL

- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 [plenum mounting in which face of test specimen is 15-3/4 inches away from the test surface] per ASTM E 795.
2. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical panels are indicated by reference to ASTM E 1264 pattern designations and not to manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range of products that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

- C. Panel Characteristics: Comply with requirements indicated on each Acoustical Panel Ceiling Product Data Sheet at the end of this Section, including those referencing ASTM E 1264 classifications.

## 2.3 ACOUSTICAL PANELS

- A. Panel Characteristics: Acoustical panels per ASTM E 1264, with painted finish, complying with pattern and other requirements indicated below:

1. Pattern: Panels matching pattern indicated by reference to manufacturer's standard product designations in "Manufacturers" Article.
2. Color/Light Reflectance Coefficient: White/LR 0.89
3. Noise Reduction Coefficient: NRC 0.65-0.75
4. Ceiling Sound Transmission Class: CSTC 35-39
5. Edge Detail: Reveal sized to fit flange of exposed suspension system members.

6. Thickness: 3/4 inch
7. Size: 24 by 24 inches

B. Suspension System Type: As described below and specified in Part 2 "Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems" Article:

1. Wide-face, capped, double-web, steel suspension system, with "step" or "shadow" type edge molding.

## 2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch- diameter wire.

D. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.

E. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.

F. Angle Hangers: Angles with legs not less than 7/8 inch wide, formed with 0.0396-inch- thick galvanized-steel sheet complying with ASTM A 446, G 90 (ASTM A 446M, Z 275) Coating Designation, with bolted connections and 5/16-inch- diameter bolts.

G. Sheet-Metal Edge Moldings and Trim: Step or "Shadow" type everywhere formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

1. For lay-in panels, provide stepped-edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

## 2.5 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Heavy -duty system.
  2. End Condition of Cross Runners: Override (stepped) type.
  3. Cap Material and Finish: Steel sheet painted white.
- B. Available Products: Subject to compliance with requirements, suspension systems that may be incorporated in the Work include, but are not limited to, the following:
1. Wide-Face, Capped, Double-Web, Steel Suspension Systems:
    - a. 1200 System/211-219 Main Tee; Chicago Metallic Corporation.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### **3.2 PREPARATION**

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

#### **3.3 INSTALLATION**

- A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
  2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
  3. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."
  4. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."

5. U.B.C. Standard for Ceiling Suspension Systems: U.B.C. Standard No. 47-18.
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
  5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  6. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
  7. Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or postinstalled anchors.
  8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. Paint the cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended for this purpose by acoustical panel manufacturer.

#### 3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09511

SECTION 09651 - RESILIENT FLOOR TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Vinyl composition tile (VCT).
- B. Related Sections include the following:
  - 1. Division 9 Section: Resilient Wall Base and Accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
- D. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor covering installation.
- D. Close spaces to traffic for 48 hours after floor covering installation.
- E. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
  - 1. Armstrong World Industries, Inc.
  - 2. Azrock Commercial Flooring, DOMCO.
  - 3. Congoleum Corporation.
  - 4. Mannington Mills, Inc.
  - 5. Tarkett, Inc.

2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 VINYL COMPOSITION TILE

- A. Vinyl Composition Tile (VCT): ASTM F 1066.
- B. Class: 2 (through-pattern tile).
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Fire-Test-Response Characteristics:
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm per ASTM E 648.

#### 2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture Testing:
  - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft.] in 24 hours.
  - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  1. Lay tiles square with room axis.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  1. Lay tiles with grain running in one direction.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
    - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
  - 1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
    - a. Use commercially available product acceptable to manufacturer.
    - b. Coordinate selection of floor polish with Owner's maintenance service.
  - 2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
  - 3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09651

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Wall Base
  - 2. Molding accessories.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

- A. Maintain temperatures within range recommended by manufacturer, but not less than **70 deg F** or more than **95 deg F**, in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than **55 deg F** or more than **95 deg F**.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than **10 linear feet** for every **500 linear feet** or fraction thereof, of each type, color, pattern, and size of resilient product installed.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

### 2.2 COLORS AND PATTERNS

- A. Colors and Patterns: As selected by Architect from manufacturer's full range.

### 2.3 RESILIENT WALL BASE

- A. Wall Base: ASTM F 1861.
  - 1. AFCO-USA, American Floor Products Company, Inc
  - 2. Armstrong World Industries, Inc.
  - 3. Azrock Commercial Flooring, DOMCO; .
  - 4. Burke Mercer Flooring Products
  - 5. Marley Flexco (USA), Inc.
  - 6. Mondo Rubber International, Inc.
  - 7. Musson, R. C. Rubber Co.
  - 8. Nora Rubber Flooring, Freudenberg Building Systems, Inc.

9. Pirelli Rubber Flooring.
10. Roppe Corporation.
11. VPI, LLC, Floor Products Division.>

- B. Type (Material Requirement): TS (rubber, vulcanized thermoset).
- C. Group (Manufacturing Method): I (solid).
- D. Style: Cove (with top-set toe) for vinyl tile and sealed concrete
- E. Style: Straight for carpet tile.
- F. Minimum Thickness: 0.125 inch.
- G. Height: 4 inches.
- H. Lengths: Coils in manufacturer's standard length.
- I. Outside Corners: Job formed.
- J. Inside Corners: Job formed.
- K. Surface: Smooth.

#### 2.4 RESILIENT MOLDING ACCESSORY

- A. Description: Carpet edge for glue-down applications, Nosing for resilient floor covering, Reducer strip for resilient floor covering, Joiner for tile and carpet.
  1. Burke Mercer Flooring Products.
  2. Marley Flexco (USA), Inc.
  3. Roppe Corporation.
  4. Stoler Industries.
- B. Material: Rubber.

#### 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - a. Cove Base Adhesives: 50 g/L.
  - b. Rubber Floor Adhesives: 60 g/L.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  2. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates for Stair Accessories: Prepare according to ASTM F 710.
  1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  3. Moisture Testing:
    - a. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.3 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

### 3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.

- a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
  - 1. Apply protective floor polish to accessory surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
    - a. Use commercially available product acceptable to manufacturer.
    - b. Coordinate selection of floor polish with Owner's maintenance service.
  - 2. Do not move heavy and sharp objects directly over accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09653

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Woven carpet.

- B. Related Sections include the following:

- 1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For the following, including installation recommendations for each type of substrate:

- 1. Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.

- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

- 1. Carpet: 12-inch- square Sample.

- 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- long Samples.

- 3. Carpet Seam: 6-inch Sample.

- C. Product Schedule: For carpet Use same designations indicated on Drawings.

- D. Qualification Data: For Installer.

- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency.

- F. Maintenance Data: For carpet to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet.

G. Warranties: Special warranties specified in this Section.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

#### 1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

#### 1.7 WARRANTY

- A. Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
  1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, excess static discharge, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

## 1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

## PART 2 - PRODUCTS

### 2.1 WOVEN CARPET

- A. Products: Subject to compliance with requirements, provide the following:
  1. Manufacturer's name; product name:
    - a. Color:
    - b. Pattern:
    - c. Source:

### 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.
  1. VOC Limits: Provide adhesives that comply with the following limits for VOC content when tested according to ASTM D 5116:
    - a. Total VOCs: 10.00 mg/sq. m x h.
    - b. Formaldehyde: 0.05 mg/sq. m x h.
    - c. 2-Ethyl-1-Hexanol: 3.00 mg/sq. m x h.
- C. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.

- D. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.
- E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
  - 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
  - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 PREPARATION**

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

### **3.3 INSTALLATION**

- A. Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
  - 1. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
  - 2. Preapplied Adhesive Installation: Comply with CRI 104, Section 11.4, "Pre-Applied Adhesive Systems (Peel and Stick)."
- B. Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
- C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- F. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, "Patterned Carpet Installations" and with carpet manufacturer's written recommendations.

#### 3.4 CLEANING AND PROTECTING

- A. Perform the following operations immediately after installing carpet:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
  - 2. Remove yarns that protrude from carpet surface.
  - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 09680

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of the following:
  - 1. Exposed interior items and surfaces.
  - 2. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
- C. Unless otherwise noted, do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Architectural woodwork and casework.
    - b. Finished mechanical and electrical equipment.
    - c. Elevator entrance doors and frames.
    - d. Elevator equipment.
    - e. Light fixtures.
    - f. Distribution cabinets.
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Furred areas.
    - b. Ceiling plenums.
    - c. Utility tunnels, except for gas pipe, which shall be painted.

- d. Pipe spaces.
- e. Duct shafts.

3. Finished metal surfaces include the following:

- a. Anodized aluminum.
- b. Stainless steel.
- c. Chromium plate.
- d. Architectural Copper.
- e. Architectural Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

- a. Valve and damper operators.
- b. Linkages.
- c. Sensing devices.
- d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

- 1. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
- 2. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
- 3. Division 8 Section "Steel Frames" for shop priming steel frames.
- 4. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

### 1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

- 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
- 2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
- 3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
- 4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
- 5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

### 1.4 SUBMITTALS

- A. Product Data: For each paint system specified. Include block fillers and primers.
  - 1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.
  - 3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
  
- B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.
  - 1. After color selection, the Architect will furnish color chips for surfaces to be coated.
  
- C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
  - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
  - 2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
  - 3. Submit Samples on the following substrates for the Architect's review of color and texture only:
    - a. Concrete: Provide two 4-inch- square samples for each color and finish.
    - b. Ferrous Metal: Provide two 4-inch- square samples of flat metal and two 8-inch- long samples of solid metal for each color and finish.
  
- D. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

## 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
  
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
  
- C. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Comply with procedures specified in PDCA P5. Duplicate finish of approved prepared samples.

1. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted.
  - a. Wall Surfaces: Provide samples on at least 100 sq. ft. of wall surface.
  - b. Small Areas and Items: The Architect will designate an item or area as required.
2. After permanent lighting and other environmental services have been activated, apply coatings in this room or to each surface according to the Schedule or as specified. Provide required sheen, color, and texture on each surface.
  - a. After finishes are accepted, the Architect will use the room or surface to evaluate coating systems of a similar nature.
3. Final approval of colors will be from job-applied samples.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
  1. Product name or title of material.
  2. Product description (generic classification or binder type).
  3. Manufacturer's stock number and date of manufacture.
  4. Contents by volume, for pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
  8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
  1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.

- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

## 1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
  - 1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in the paint schedules.
  - 1. PPG Industries, Inc. (PPG).
  - 2. Pratt & Lambert, Inc. (P & L).
  - 3. Sherwin-Williams Co. (S-W).

### 2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
  - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
  
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

**3.2 PREPARATION**

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
  
- B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
  
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to requirements of SSPC-SP 10.

- b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
  - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
- D. **Materials Preparation:** Mix and prepare paint materials according to manufacturer's written instructions.
- 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  - 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. **Tinting:** Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.3 APPLICATION

- A. **General:** Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
- 1. Paint colors, surface treatments, and finishes are indicated in the schedules.
  - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  - 3. Provide finish coats that are compatible with primers used.
  - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
  - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  - 8. Sand lightly between each succeeding enamel or varnish coat.
- B. **Scheduling Painting:** Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- 1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by

- the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
  3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Piping, pipe hangers, and supports.
  2. Roof Top Units
  3. Insulation.
  4. Accessory items.
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

- I. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.
- J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

### 3.4 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

### 3.5 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
  - 1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.6 INTERIOR PAINT SCHEDULE

- A. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:
  - 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a block filler.
    - a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils.
      - 1) PPG:6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
      - 2) P & L:Z 98 Pro-Hide Plus Latex Block Filler.

- b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
  - 1) PPG:89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
  - 2) P & L:Z/F 4000 Series Accolade Interior Velvet.
  
- B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
  - 1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
    - a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
      - 1) PPG:17-10 Quick-Drying Interior Latex Primer-Sealer.
      - 2) P & L:Z/F 1004 Suprime "4" Interior Latex Wall Primer.
  
    - b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.
      - 1) PPG:89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
      - 2) P & L:Z/F 4000 Series Accolade Interior Velvet.
  
- C. Ferrous Metal: Provide the following finish systems over ferrous metal:
  - 1. Semigloss, Alkyd-Enamel Finish: One finish coat over an enamel undercoater and a primer.
    - a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.
      - 1) PPG:6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
      - 2) P & L:S 4551 Tech-Gard High Performance Rust Inhibitor Primer.
      - 3) S-W:Kem Kromik Metal Primer B50N2/B50W1.
  
    - b. Undercoat: Alkyd, interior enamel undercoat or semigloss, interior, alkyd-enamel finish coat, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.
      - 1) PPG:6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
      - 2) P & L:S/D 1011 Suprime "11" Interior Alkyd Wood Primer.
      - 3) S-W:ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200.
  
    - c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils.
      - 1) PPG:27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-Gloss Oil.
      - 2) P & L:S/D 5700 Cellu-Tone Alkyd Satin Enamel.
      - 3) S-W:Classic 99 Interior/Exterior Semi-Gloss Alkyd Enamel A-40 Series.

**HFS Architects**  
**DFCM #07061480**  
**HFS #0715.01**

**AASF AVIATION COMPLEX INTERIOR REMODEL**  
**Utah National Guard**

END OF SECTION 09900

SECTION 10505 - METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Knocked-down, quiet metal lockers.
  - 2. Locker benches.
- B. Related Sections include the following:
  - 1. Division 6 Section "Rough Carpentry for concealed wood support base, furring, blocking, and shims required for installing metal lockers and concealed within other construction before metal locker installation.

1.3 DEFINITIONS

- A. Uncoated Steel Sheet Thicknesses: Indicated as the minimum thicknesses.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show filler panels recess trim and other accessories.
  - 2. Include locker identification system.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For metal lockers and locker benches, in manufacturer's standard sizes.

- E. Qualification Data: For Installer.
- F. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.
- G. Warranty: Special warranty specified in this Section.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative of metal locker manufacturer for installation and maintenance of units required for this Project.
- B. Source Limitations: Obtain metal lockers and accessories through one source from a single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of metal lockers and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
  - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- D. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with [the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."] [ICC A117.1.] [FED-STD-795, "Uniform Federal Accessibility Standards."
  - 1. Provide 1 shelf located no higher than 48 inches above the floor for forward reach..
  - 2. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

#### 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify the following by field measurements before fabrication and indicate measurements on Shop Drawings:

1. Concealed framing, blocking, and reinforcements that support metal lockers before they are enclosed.
2. Recessed openings.
3. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

#### 1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
  1. Failures include, but are not limited to, the following:
    - a. Structural failures.
    - b. Faulty operation of latches and other door hardware.
  2. Damage from deliberate destruction and vandalism is excluded.
  3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

#### 1.10 EXTRA MATERIALS

- A. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Full-size units of the following metal locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than 5 units:
    - a. Identification plates.
    - b. Hooks.

### PART 2 - PRODUCTS

#### METAL LOCKERS

## 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Products: Subject to compliance with requirements, provide one of the products specified.
  3. Basis-of-Design Product: The design for each metal locker specified is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS) Type B, suitable for exposed applications.
- B. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch steel mesh, with at least 70 percent open area.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304.
- D. Extruded Aluminum: ASTM B 221, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.
- E. Plastic Laminate: NEMA LD 3, Grade HGP.
- F. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.
- G. Anchors: Select material, type, size, and finish required for secure anchorage to each substrate.
1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
  2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

## 2.3 KNOCKED-DOWN, QUIET METAL LOCKERS

- A. Basis-of-Design Product: Republic Storage Systems, LLC or a comparable product of one of the following:

B. Products:

1. Art Metal Products, Div. of Fort Knox Storage Co.;
2. DeBourgh Mfg. Co.;
3. General Storage Systems, Div. of North American Steel; Decor Tri-Lok.
4. Hadrian Inc.; Emperor
5. List Industries Inc.
6. Lyon Workspace Products;
7. Penco Products, Inc., Subsidiary of Vesper Corporation; Lockers.
8. Republic Storage Systems Company;
9. Shanahan's Ltd.; Deluxe Series Lockers.
10. Tenssco Corp.; Tenssco Lockers.

C. Locker Arrangement: Single tier

D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated, cold-rolled steel sheet with thicknesses as follows:

1. Tops, Bottoms, and Intermediate Dividers: 0.0209 inch, with single bend at sides.
2. Backs and Sides: 0.0209 inch thick, with full-height, double-flanged connections.
3. Shelves: 0.0209 inch (0.55 mm) thick, with double bend at front and single bend at sides and back.

E. Frames: Channel formed; fabricated from 0.0528-inch-thick, cold-rolled steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical frame members.
2. Frame Vents: Fabricate [vertical] [horizontal] face frames with vents.

F. Doors: One-piece; fabricated from 0.0528-inch thick, cold-rolled steel sheet; formed into channel shape with double bend at vertical edges, and with right-angle single bend at horizontal edges.

1. Doors less than 12 inch wide may be fabricated from 0.0428-inch-thick, cold-rolled steel sheet.
2. Box lockers less than 15 inches wide may be fabricated from 0.0428-inch-thick, cold-rolled steel sheet.
3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.0428-inch-thick, cold-rolled steel sheet; welded to inner face of doors.
5. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
6. Door Style: Vented panel as follows:

- a. Diamond shaped perforations 3/4" wide by 1-1/2" high to provide free flow while leaving sufficient metal for rigidity
- G. Hinges: Self-closing; welded to door and attached to door frame with not less than 2 factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
  - 1. Knuckle Hinges: Steel, full loop, 5 or 7 knuckles, tight pin; minimum 2 inches high. Provide not less than 3 hinges for each door more than 42 inches high.
- H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry resistant.
  - 1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic and prelocking.
    - a. Latch Hooks: Equip doors 48 inches and higher with 3 latch hooks fabricated from minimum 0.0966-inch- thick steel; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
    - b. Latching Mechanism: Manufacturer's standard rattle-free latching mechanism and moving components isolated with nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
- I. Combination Padlocks: Provided by Owner.
- J. Equipment: Equip each metal locker with identification plate and the following, unless otherwise indicated:
  - 1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
- K. Accessories:
  - 1. Filler Panels: Fabricated from cold-rolled steel sheet, manufacturer's standard thickness, but not less than 0.0329 inch (0.85 mm)] thick.
  - 2. Finished End Panels: Fabricated from 0.0209-inch-thick, cold-rolled steel sheet.
- L. Finish: Powder coat.
  - 1. Color: As selected by Architect from manufacturer's full range

## 2.4 LOCKER BENCHES

- A. General: Provide locker benches fabricated by same manufacturer as metal lockers.
- B. Bench Tops: Manufacturer's standard 1-piece units, of the following material, minimum 9-1/2 inches wide by 1-1/4 inches thick, with rounded corners and edges:
  - 1. Laminated maple with one coat of clear sealer on all surfaces, and one coat of clear lacquer on top and sides.
- C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:
  - 1. Tubular Steel: 1-1/4-inch-diameter steel tubing, with 0.1265-inch- (3.2-mm-) thick steel flanges welded at top and base; with baked-enamel finish; anchored with exposed fasteners.
    - a. Color: As selected by Architect from manufacturer's full range.

## 2.5 FABRICATION

- A. General: Fabricate metal lockers square, rigid, and without warp; with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.
  - 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet, unless otherwise indicated.
  - 2. Provide fasteners, filler plates, supports, clips, and closures as required for a complete installation.
- B. Unit Principle: Fabricate each metal locker with an individual[ **door and**] frame; individual top, bottom, and back; and common intermediate uprights separating compartments.
- C. Knocked-Down Construction: Fabricate metal lockers for nominal assembly at Project site using nuts, bolts, screws, or rivets. Factory weld frame members together to form a rigid, one-piece assembly.
- D. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.
- E. Identification Plates: Manufacturer's standard etched, embossed, or stamped aluminum plates; with numbers and letters at least 3/8 inch high.
- F. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip joint filler angle formed to receive filler panel.
- G. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

## 2.6 STEEL SHEET FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.
- C. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.
- D. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install level, plumb, and true; shim as required, using concealed shims.
  1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than **36 inches (910 mm)** o.c. Install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion, using concealed fasteners.
  2. Anchor single rows of metal lockers to walls near top and bottom of lockers
- B. Knocked-Down Metal Lockers: Assemble knocked-down metal lockers with standard fasteners, with no exposed fasteners on door faces or face frames.

- C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
  - 1. Attach hooks with at least two fasteners.
  - 2. Identification Plates: Identify metal lockers with identification indicated on Drawings.
    - a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
    - b. Attach plates to upper shelf of each open-front metal locker, centered, with a least two aluminum rivets.
  - 3. Attach filler panels with concealed fasteners. Locate fillers panels where indicated on Drawings.
  - 4. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.
- D. Fixed Locker Benches: Provide not less than 2 pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

### 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.
- B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit metal locker use during construction.
- C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal locker manufacturer.

END OF SECTION 10505

**SECTION 13352**

**DUCT TESTING, ADJUSTING, AND BALANCING**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Includes But Not Limited To
  - 1. Test, balance, and adjust air duct systems as described in Contract Documents.
- B. Related Sections
  - 1. Division 15 -
    - a. Complete installation and start-up of mechanical systems, and changes in sheaves, belts, and dampers as required for correct balance.
    - b. Assist Balancing Agency in testing and balancing of mechanical system.

**1.2 SYSTEM DESCRIPTION**

- A. Performance Requirements
  - 1. Perform testing and balancing in complete accordance with Associated Air Balance Council Standards for Field Measurement & Instructions, Form P1266, Volume I. Record test data on AABC standard forms or facsimile.
  - 2. Noise level shall not exceed PNC 35 when all mechanical equipment is operating.

**1.3 SUBMITTALS**

- A. [Quality Assurance / Control](#)
  - 1. Four copies of complete test data for evaluation and approval.
  - 2. Test And Balance Report -
    - a. Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.
    - b. Certified accurate and complete by Balancing Agency's certified test and balance engineer.
    - c. Contain following general data in format selected by Balancing Agency.
      - 1) New Corporate Office for
      - 2) Project Title
      - 3) Project Location
      - 4) Project Architect and Mechanical Engineer
      - 5) Test and Balance Agency and Certified Engineer
      - 6) Contractor and mechanical sub-contractor
      - 7) Dates tests were performed
      - 8) Certification Document
      - 9) Report Forms similar to AABC Standard format.
    - d. Report shall include following -
      - 1) Preface suggesting abnormalities and problems encountered
      - 2) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.
      - 3) System Identification reporting location of zones, supply, return, and exhaust openings.
      - 4) Record following for each piece of air handling equipment.
        - a) Manufacturer, model number, and serial number
        - b) Design and manufacturer rated data
        - c) Actual CFM
        - d) Suction and discharge static pressure of each fan
        - e) Outside-air and return-air total CFM

- f) Actual operating current, voltage, and brake horsepower of each fan motor
  - g) Final RPM of each motor
  - h) Fan and motor sheave manufacturer, model, size, number of grooves and center distance
  - i) Belt size and quantity
  - j) Static-pressure controls final operating set points
3. Bind approved copy of report in Operations And Maintenance Manual for Division 15.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications
  1. Work of this Section shall be performed by independent Air Testing And Balance Agency specializing in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
  2. Agency shall provide proof of having successfully completed at least five years of specialized experience in air system balancing. Work by this Agency shall be done under direct supervision of qualified heating and ventilating engineer employed by Agency.
  3. Agency shall be approved in writing by Architect.
  4. Neither Architect's engineering consultant or anyone performing work on this Project under Division 15 shall be permitted to do this work.

#### 1.5 SCHEDULING

- A. Award test and balance subcontract to Agency upon receipt of Notice To Proceed to allow Agency to schedule this work in cooperation with other Sections involved and to comply with completion date.
- B. During construction, Agency shall inspect installation of pipe systems, sheet metal work, temperature controls, and other component parts of mechanical systems. Perform inspections as follows
  1. One inspection when 60 percent of duct work is installed.
  2. One inspection when 90 percent of equipment is installed.
- C. Do not begin air testing and balancing until
  1. After completion of air cooling, heating, and exhaust systems including installation of specialties, devices, and new filters.
  2. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
  3. Automatic temperature controls have been calibrated and set for design operating conditions.
  4. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.
- D. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

**PART 2 PRODUCTS** - Not Used

## PART 3 EXECUTION

### 3.1 ACCEPTABLE TEST AND BALANCE COMPANIES

- A. BTC Services
- B. Bonneville Test and Balance
- C. Diamond Test and Balance
- D. Flo Rite Inc.
- E. Intermountain Test and Balance
- F. R & S Balancing Inc.

### 3.2 FIELD QUALITY CONTROL

- A. Site Tests
  - 1. If requested, conduct tests in presence of Architect.
  - 2. Instruments used by Agency shall be accurately calibrated and maintained in good working order.
  - 3. Air Testing And Balancing Procedure -
    - a. Perform tests at high and low speeds of multi-speed systems and single speed systems. Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards -
      - 1) Fan Speeds - Test and adjust fan RPM to achieve design CFM requirements.
      - 2) Current and Voltage - Measure and record motor current and voltage.
      - 3) Pitot-tube Traverse - Perform Pitot-tube traverse of main supply and return ducts to obtain total CFM.
      - 4) Outside Air - Test and adjust system minimum outside air by Pitot-tube traverse.
      - 5) Static Pressure - Test and record system static pressures, including suction and discharge static pressure of each fan.
      - 6) Air Temperature - Take wet and dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
      - 7) Main Ducts - Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
      - 8) Branch Ducts - Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
      - 9) Tolerances - Test and balance each diffuser, grille, and register to within 10 percent of design requirements.
      - 10) Identification - Identify location and area of each grille, diffuser, and register. Record on air outlet data sheets.
      - 11) Description - Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
      - 12) Drafts - Adjust diffusers, grilles, and registers to minimize drafts.
    - b. Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.
  - 4. Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system's CFM total is less than 10 percent of design CFM. Before test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Architect will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.

- a. Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Architect to generate smoke.
  - b. Close openings in duct except for one opening at farthest end of duct run.
  - c. Circulate smoke at pressurized condition of 1/2 inch minimum water gauge static pressure.
  - d. Report findings to Architect in writing.
- B. Final Inspection And Adjustments
1. System shall be balanced and reports submitted to Architect before prefinal inspection.
  2. Balancing Agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
    - a. Architect will choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building. If recheck testing demonstrates measured flow deviation of 10 percent or more from recorded information on report, report will be rejected and new inspection and report will be made and resubmitted.
    - b. Perform re-balancing in presence of Architect and subject to its approval.
    - c. If re-balancing is required, submit revised air test and balance reports to Architect before Substantial Completion.
    - d. Spot balance and rebalance shall be performed at no additional cost to Owner.
  3. Where furnace supplied to job site provides over 5 percent more air than schedule requirements, rooms supplied by that furnace shall have their supply air quantities increased by ratio of actual total air quantity supplied to minimum air quantity required by furnace schedule.

END OF SECTION

## SECTION 15051

### GENERAL MECHANICAL REQUIREMENTS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. General requirements and procedures for mechanical systems.
  - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
  - 3. Interface with Testing And Balancing Agency.
  - 4. Furnish and install sealants relating to installation of systems installed under this Division.
  - 5. Furnish and install Firestop Penetration Systems for mechanical system penetrations as described in Contract Documents.
- B. Products Supplied But Not Installed Under This Section
  - 1. Sleeves, inserts, supports, and equipment for mechanical systems installed under other Sections.
- C. Related Sections
  - 1. Division 16 - Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches

##### 1.2 SUBMITTALS

- A. **Product Data**
  - 1. Manufacturer's catalog data for each manufactured item.
    - a. Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
    - b. Include name, address, and phone number of each supplier.
- B. **Shop Drawings**
  - 1. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.
  - 2. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.
  - 3. Drawing of each temperature control panel identifying components in panels and their function.
  - 4. Other shop drawings required by Division 15 trade Sections.
- C. **Closeout**
  - 1. Operation And Maintenance Manual Data -
    - a. Modify and add to requirements of Section 01700 as follows -
      - 1) At beginning of MECHANICAL section of Operations And Maintenance Manual, provide master index showing items included.

- 2) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Mechanical, Plumbing, Sheet Metal and Temperature Control subcontractors.
- 3) Provide operating instructions to include -
  - a) General description of each plumbing and mechanical system.
  - b) Step by step procedure to follow in putting each piece of mechanical equipment into operation.
  - c) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
- 4) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include -
  - a) List of mechanical equipment used indicating name, model, serial number, and name plate data of each item together with number and name associated with each system item.
  - b) Manufacturer's maintenance instructions for each piece of mechanical equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
  - c) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
- 5) Include copies of approved shop drawings and copies of warranties required in individual Sections of Division 15.

### 1.3 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies
  1. Perform work in accordance with applicable provisions of local Plumbing Code, Gas Ordinances, and adoptions thereof. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
  2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Architect in writing of such differences.
- B. Identification
  1. Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when Project is turned over to Owner.
  2. Materials shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Storage
  1. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by Architect until installed.
  2. Store items subject to moisture damage, such as controls, in dry, heated spaces.
- B. Handling
  1. Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

## 1.5 WARRANTY

- A. Guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
- B. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.
- C. If mechanical sub-contractor with offices located more than 150 miles from Project site is used, provide service / warranty work agreement for warranty period with local mechanical sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

## 1.6 SYSTEM START-UP

- A. Off-Season Start-up
  - 1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
  - 2. Notify Owner seven days minimum before scheduled start-up.
  - 3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
  - 4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to following
  - 1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
  - 2. Make adjustments to insure that -
    - a. Equipment alignments and clearances are adjusted to allowable tolerances.
    - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
    - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
    - d. Miscellaneous alignments, tightenings, and adjustings are completed so systems are tight and free from leakage and equipment performs as intended.
  - 3. Motors and accessories are completely operable.
  - 4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
  - 5. Adjust drives for proper alignment and tension.
  - 6. Make certain filters in equipment for moving air are new and of specified type.
  - 7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

## 1.7 OWNER'S INSTRUCTIONS

- A. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing.
  - 1. Minimum Instruction Periods -
    - a. Mechanical - Eight hours
    - b. Temperature Control - Four hours
    - c. Refrigeration - One hour

2. Instruction periods shall occur after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

**PART 2 PRODUCTS - Not Used**

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Site Inspection
  1. Examine premises to understand conditions which may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work which requires correction.
  2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
- B. Drawings
  1. Plumbing and Mechanical Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
  2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing and Mechanical Drawings.
  3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- C. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

**3.3 PREPARATION**

- A. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
- B. Changes Due To Equipment Selection
  1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
  2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
  3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of the system resulting from selection of equipment, including all required changes in affected trades.

4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

### 3.4 INSTALLATION

- A. Interface With Other Work
  1. Electrical - Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
  2. Testing And Balancing -
    - a. Put mechanical systems into full operation and continue their operation during each working day of testing and balancing.
    - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by appropriate Sections of Division 13 and at no additional cost to Owner.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment
  1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
  2. Adjust locations of pipes, ducts, switches, panels, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
  3. Install mechanical work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
  4. Determine exact route and location of each pipe and duct prior to fabrication.
    - a. Right-Of-Way -
      - 1) Lines which pitch shall have right-of-way over those which do not pitch. For example, steam, steam condensate, and plumbing drains shall normally have right-of-way.
      - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
    - b. Offsets, Transitions, and Changes in Direction -
      - 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
      - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops - Install Penetration Firestop System appropriate for penetration at mechanical system penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants
  1. Seal openings through building exterior caused by penetrations of elements of mechanical systems.
  2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

### 3.5 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
  1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.

2. Surface finishes shall exactly match existing finishes of same materials.

B. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.

### 3.6 CLEANING

A. Clean exposed piping, ductwork, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.

C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

### 3.7 PROTECTION

A. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.

B. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

END OF SECTION

## SECTION 15071

### SEISMIC AND VIBRATION CONTROL

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Quality of and requirements for anchorage and seismic restraint systems and vibration isolation systems for mechanical and other equipment.
  - 2. Equipment to be seismically restrained -
    - a. Rooftop Unit
    - b. Water heater
    - c. Existing fan coil units
    - d. Condensing units
  - 3. All existing and new gas piping to be restrained.
  - 4. All existing and new domestic water piping to be restrained.
  - 5. All existing and new ductwork.

##### 1.2 REFERENCES

- A. American Society for Testing and Materials ASTM.
  - 1. ASTM A 615-96a, 'Standard Specification for Deformed & Plain Billet-Steel Bars for Concrete Reinforcement'
- B. Sheet Metal & Air Conditioning Contractors National Association, Inc.
  - 1. SMACNA Seismic Restraint Manual, 'Guidelines For Mechanical Systems'

##### 1.3 SUBMITTALS

- A. Product Data
  - 1. Restraint system and anchorage method to be used for each piece of equipment.
  - 2. Seismic restraints and calculations for all flexible mounted equipment.
  - 3. Vibration isolators and flexible couplings.
  - 4. Clearly outlined procedures for installing and adjusting isolators, seismic bracing anchors and snubbers.
- B. Shop Drawings
  - 1. Show size, hanger length and location of seismic restraints for gas piping.
  - 2. Submit details for each isolator and seismic brace with snubbers proposed for specified equipment.
  - 3. Submit details for proposed structural steel frames and rails and for anchors to be used in conjunction with isolation of equipment.
  - 4. Submit details of supports, hangers, anchorage and bracing for isolated equipment as designed or proposed by professional engineer employed by Restraint Manufacturer and qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for seismic bracing and anchors shall bear engineer's signed professional seal.
  - 5. Submit anchor bolt calculations, signed and stamped by registered engineer, showing adequacy of bolt sizing and type.
    - a. Calculations shall include anchor embedment, minimum edge distance and minimum center distance.
    - b. Design lateral forces shall be distributed in proportion to mass distribution of equipment.
    - c. Furnish calculations for anchors on restraint devices, cable, isolators, and on rigidly mounted equipment.

## 1.4 QUALITY ASSURANCE

- A. Regulator Requirements - System design and installation shall meet seismic requirements as defined in 1997 Edition of Uniform Building Code, Section 1626 and applicable state and local codes in accordance with Seismic Zone 3 with minimum restraint capability of 1.0 g. Explicit requirements and details can be found in referenced SMACNA Manual.
- B. Seismic Requirements - Mechanical equipment, piping and ductwork shall be braced, snubbed or supported to withstand seismic disturbances and remain operational.
- C. Vibration Isolation Requirements - Isolate mechanical equipment from structure by means of resilient vibration and noise isolators.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Isolation and Seismic Equipment
  - 1. Piping - Restrain piping in accordance with Figures 4.11 to 4.19 in SMACNA Manual.
  - 2. Equipment with Fixed Anchor or Support -
    - a. Restraint designed according to Table 16-0, Section 1626 of Uniform Building Code with importance factor as scheduled on Drawings.
    - b. Horizontal force factor for elements of structures -
      - 1) In addition, vertical force restraint requirement shall be computed at ½ value of horizontal forces.
      - 2) Restrain equipment not anchored directly to floors by cable system designed and furnished by Restraint Manufacturer.

### 2.2 APPROVED MANUFACTURERS

- A. Seismic restraint equipment and resilient isolation devices shall be designed and furnished by single manufacturer.
  - 1. Amber / Booth Company, Houston, TX (713) 688-1228.
  - 2. Mason Industries Inc., Hauppauge, NY (516) 348-0282 - [www.mason-ind.com](http://www.mason-ind.com)
  - 3. Vibration Mountings and Control Inc., Bloomington, NJ (201) 838-1780

### 2.3 FINISHES

- A. Clean and paint steel components. Thoroughly clean structural steel bases of welding slag and prime with zinc-chromate or metal etching primer. Etch and paint hot dipped galvanized steel components.

## PART 3 EXECUTION

### 3.1 ISOLATION

- A. Isolation Equipment
  - 1. Install snubbers with factory set clearances.
  - 2. Piping -
    - a. Protect isolated and non-isolated piping 2-1/2 inches (inside diameter) and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motions.
    - b. Locations shall be as scheduled and shall include but not be limited to -
      - 1) At all drops to equipment and at flexible connections.
      - 2) At all 45 degree or greater changes in direction of pipe.

- 3) At horizontal runs of pipe, not to exceed 30 feet on center spacing.

END OF SECTION

## SECTION 15075

### MECHANICAL IDENTIFICATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install identification of equipment and piping as described in Contract Documents.

#### PART 2 PRODUCTS

##### 2.1 LABELS

- A. Equipment Identification - Black formica, with white reveal when engraved. Lettering to be 3/16 inch high minimum.

##### 2.2 PAINT

- A. One Coat Primer -
  - 1. 6-2 Quick Drying Latex Primer Sealer over fabric covers.
  - 2. 6-205 Metal Primer under dark color paint
  - 3. 6-6 Metal Primer under light color paint.
- B. Finish Coats - Two coats 53 Line Acrylic Enamel.
- C. **Quality Standard** - Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA (800) 441-9695 [www.ppgaf.com](http://www.ppgaf.com)
- D. **Approved Products**
  - 1. Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
    - a. Benjamin Moore, Montvale, NJ (888) 236-6667 or (201) 573-9600  
[www.benjaminmoore.com](http://www.benjaminmoore.com)
    - b. ICI Dulux, Cleveland, OH (800) 984-5444 or (216) 984-5444  
[www.icidulux.com](http://www.icidulux.com)
    - c. Sherwin Williams, Cleveland, OH (800) 321-8194 or (216) 566-2000  
[www.sherwin-williams.com](http://www.sherwin-williams.com)

#### PART 3 EXECUTION

##### 3.1 APPLICATION

- A. Labels
  - 1. Identify following items with specified labels fastened to equipment with screws -
    - a. Thermostats and control panels in mechanical spaces
    - b. Furnaces
    - c. Condensing units
    - d. Electric duct heaters
  - 2. Labels shall contain following data engraved -
    - a. Equipment mark noted on Drawings (i.e., RTU-1)
    - b. Area served (i.e., West Offices)

- B. Painting
  - 1. Only painted legends, directional arrows, and color bands are acceptable.
  - 2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system -
    - a. Adjacent to each item of equipment.
    - b. At point of entry and exit where piping goes through wall.
    - c. On each riser and junction.
    - d. Every 25 feet on long continuous lines.
    - e. Stenciled symbols shall be one inch high and black.

### 3.2 SCHEDULES

- A. Schedule of Abbreviations for Pipe Stencils and Equipment Identification and Background Colors for Pipe Identification
  - 1. Apply stenciled symbols and continuous painting as follows -

<u>Pipe Type</u>	<u>Pipe Color</u>	<u>Symbol</u>
Gas	Yellow	GAS

END OF SECTION

## SECTION 15081

### DUCT INSULATION

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install thermal wrap duct insulation as described in Contract Documents.
- B. Related Work
  - 1. Section [15812](#) - Low-Pressure Steel Ducts
  - 2. Section [15820](#) - Acoustic duct liner

##### 1.2 REFERENCES

- A. [American Society for Testing and Materials](#)
  - 1. ASTM B 209-01, 'Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate'

#### PART 2 PRODUCTS

##### 2.1 MATERIALS

- A. Thermal Wrap Duct Insulation
  - 1. 1-1/2 inch thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of one lb/ per cu ft.
  - 2. Thermal Conductivity - 0.27 BTU in/HR SF deg F at 75 deg F maximum.
  - 3. [Approved Products](#) -
    - a. Type 100 standard duct insulation by Certainteed St Gobain, Valley Forge, PA (800) 233-8990 or (610) 341-7739 [www.certainteed.com](http://www.certainteed.com)
    - b. Microlite FSK by Johns-Manville, Denver, CO (800) 654-3103 or (303) 978-2000 [www.jm.com](http://www.jm.com)
    - c. Duct Wrap FSK by Knauf Fiber Glass, Shelbyville, IN (800) 825-4434 or (317) 398-4434 [www.knauffiberglass.com](http://www.knauffiberglass.com)
    - d. Alley Wrap FSK by Manson Insulation Inc, Brossard, BC, Canada (800) 626-7661 or (450) 659-9101
    - e. FRK by Owens-Corning, Toledo, OH (800) 438-7465 or (419) 248-8000 [www.owenscorning.com](http://www.owenscorning.com)
- B. Jackets
  - 1. 0.020 inch thick smooth aluminum sheet meeting requirements of ASTM B 209.
  - 2. 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.

#### PART 3 EXECUTION

##### 3.1 INSTALLATION

- A. Thermal Wrap Duct Insulation
  - 1. Install insulation as follows -
    - a. On outside air ducts and combustion air ducts within building insulation envelope.

- b. On other air ducts where indicated on Drawings.
- 2. Wrap insulation tightly on duct work with circumferential joints butted and longitudinal joints overlapped minimum 2 inches.
  - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch thick.
  - b. Remove insulation from lap prior to stapling.
  - c. Staple seams at approximately 16 inches on center with outward clenching staples.
  - d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.
- B. Insulate outside of ceiling diffusers, diffuser drops, and duct silencers same as ductwork.

END OF SECTION

## SECTION 15196

### NATURAL GAS PIPING

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install gas piping and fittings within building and from building to meter including connection to meter as described in Contract Documents.

##### 1.2 REFERENCES

- A. [American Society For Testing And Materials](#)
  - 1. ASTM A 53-01, 'Standard Specification for Pipe, Steel and Hot-Dipped, Zinc-Coated, Welded and Seamless'
  - 2. ASTM A 234-00a, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperature Service'
  - 3. ASTM D 2513-00, 'Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings'

##### 1.3 QUALITY ASSURANCE

- A. Qualifications
  - 1. Welders shall be certified and bear evidence of certification 30 days before commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.
  - 2. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

#### PART 2 PRODUCTS

##### 2.1 COMPONENTS

- A. Above-Ground Pipe And Fittings - Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of ASTM A 53. Welded forged steel fittings meeting requirements of ASTM A 234 or standard weight malleable iron screwed.

##### 2.2 MANUFACTURED UNITS

- A. Valves
  - 1. 125 psi bronze body ball valve, UL listed
  - 2. [Approved Products](#) -
    - a. Apollo Series 80-100 by ConBraCo
    - b. FIG-30-A by Jenkins Valves
    - c. Model T-204 by Jomar International
    - d. 3410 by McDonald Valves & Fittings
    - e. BCI-100T (with tee handle) by Milwaukee Valve
    - f. 'Red Cap' gas ball valve by PGL Corp
    - g. Model B-6000-UL by Watts Regulator
- B. Cocks

1. Gauge Cocks - Conbraco #41-560 bronze gauge cock.
2. Lubricated Balancing Cocks -
  - a. Square head type suitable for 175 psig wog at 150 deg F.
  - b. Wrench handle for each valve.
  - c. 2 inches And Smaller -
    - 1) Cast iron body with screwed connections.
    - 2) [Approved Products](#) -
      - a) Powell - 2200
      - b) Walworth - 1796
  - d. 2-1/2 to 5 inches -
    - 1) Cast iron body with flanged connections.
    - 2) [Approved Products](#) -
      - a) Powell - 2201
      - b) Walworth - 1797F

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- A. Steel pipe installed through air plenums, in walls, and pipes 2-1/2 inches and larger shall have welded fittings and joints. Other steel pipe may have screwed or welded fittings.
- B. On lines serving gas-fired equipment, install gas cocks adjacent to equipment outside of equipment cabinet and easily accessible.
- C. Install 6 inch long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- D. Use fittings for changes of direction in pipe and for branch runouts.

#### **3.2 FIELD QUALITY CONTROL**

- A. Site Tests - Before pipes are concealed from view, test systems in Architect's presence at 60 psig for 4 hours and show no drop in pressure.

END OF SECTION

## SECTION 15550

### PACKAGED ROOFTOP UNIT (3 - 12-1/2 TON)

#### PART 1 GENERAL

##### 1.1 SYSTEM DESCRIPTION

- A. Outdoor rooftop, electrically controlled heating and cooling utilizing a scroll compressor for cooling duty and gas combustion for heating duty. Unit shall discharge supply air vertically as shown on contract drawings.

##### 1.2 QUALITY ASSURANCE

- A. Unit shall be rated in accordance with ARI Standards 210/240 or 360 and 270.
- B. Unit shall be designed to conform to ASHRAE 15, latest revision, and in accordance with UL 1995.
- C. Unit shall be UL tested and certified in accordance with ANSI Z21.47 Standard and UL listed and certified under Canadian Standards as a total package for safety requirements.
- D. Roof curb shall be designed to conform to NRCA Standards.
- E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- F. Unit casing shall be capable of exceeding Federal Test Method Standard No. 141 (Method 6061) 500-Hour Salt Spray Test.
- G. Each unit is subjected to completely automated run testing on the assembly line. Each unit contains a factory-supplied printout indicating tested pressures, amperages, data, and inspectors; providing certification of the unit status at the time of manufacture.

##### 1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit(s) shall be stored and handled per manufacturers recommendations.

#### PART 2 PRODUCTS

##### 2.1 EQUIPMENT (STANDARD)

- A. General:
  - 1. Factory-assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-22), and special features required prior to field start-up.
- B. Unit Cabinet:
  - 1. Unit cabinet shall be considered of galvanized steel, bonderized and coated with a baked enamel finish on all externally exposed surfaces, and have primer-coated interior surfaces on all panels.
  - 2. Evaporator-fan cabinet interior shall be insulated with a minimum 1/2 inch thick flexible fiberglass insulation coated on the air side. Aluminum foil-faced fiberglass insulation shall be used in the heating compartment.
  - 3. Cabinet panels shall be easily removable for servicing.

4. Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging, and forklift slots shall be provided to facilitate maneuvering.
  5. Unit shall have a factory-installed, sloped condensate drain pan made of a non-corrosive material, providing a minimum 3/4 inch connection with both vertical and horizontal drains and shall comply with ASHRAE 62.
  6. Unit shall have factory-installed filter access panel to provide filter access with tool-less removal.
  7. Unit shall have standard thru-the-bottom power connection capability.
- C. Fans:
1. Indoor blower (evaporator fan) shall be of the belt-driven, double inlet, forward-curved centrifugal type. Belt drive shall include an adjustable pitch motor pulley.
  2. Indoor blower (evaporator fan) shall be made from steel with a corrosion-resistant finish and shall be dynamically balanced.
  3. Bearings shall be of the sealed, permanently lubricated, ball-bearing type for longer life and lower maintenance.
  4. Condenser fan shall be of the direct-driven propeller type and shall discharge air vertically upward.
  5. Condenser fan shall have blades riveted to corrosion-resistant steel spiders and shall be dynamically balanced.
  6. Condenser-fan motor shall be totally enclosed.
  7. Induced draft blower shall be of the direct-driven, single inlet, forward curved, centrifugal type, shall be made from steel with a corrosion-resistant finish, and shall be dynamically balanced.
- D. Compressor(s):
1. Fully hermetic scroll type, internally protected.
  2. Factory rubber-shock mounted and internally spring mounted for vibration isolation.
  3. On independent circuits.
- E. Coils:
1. Evaporator and condenser coils shall have aluminum plate fins mechanically bonded to enhanced copper tubes with all joints brazed.
  2. Tube sheet openings shall be belled to prevent tube wear.
  3. Evaporator coil shall be of the face-split design.
- F. Heating Section:
1. Induced draft combustion type with energy saving direct spark ignition system, redundant main gas valve, and 2-stage heat.
  2. The heat exchanger shall be of the tubular section type constructed of a minimum of 20 gage steel coated with a nominal 1.2 mil aluminum-silicone alloy for corrosion resistance, and shall have a 10-year warranty.
  3. Burners shall be of the in-shot type constructed of aluminum coated steel.
  4. The Integrated Gas Control (IGC) board shall provide timed control of evaporator fan functioning and burner ignition. An LED (light-emitting diode) shall provide diagnostic information. The LED shall be visible without removing the control box access panel.
  5. IGC board contains anti-cycle protection for gas heat operation (after 4 continuous cycles on high temperature limit switch and one cycle on the flame rollout switch).
- G. Refrigerant Components:  
Refrigerant circuit components shall include:
1. Actuator feed system.
  2. Refrigerant strainer, or filter drier.
  3. Service gage connections on suction, discharge, and liquid lines.
  4. Ability to route gage hoses through unit top cover, or outdoor panel.

- H. Filter Section:
1. Standard filter section shall consist of factory-installed low-velocity, throwaway 2-in. thick fiberglass filters of commercially available sizes.
  2. Filter face velocity shall not exceed 300 fpm at nominal airflows.
  3. Filter section shall use only one size filter.
  4. Filters shall be accessible through an access panel with "tool-less" removal.
- I. Controls and Safeties:
1. Unit Controls  
Unit shall be complete with self-contained low-voltage control circuit protected by a fuse on the 24-v transformer side.
  2. Safeties:
    - a. Unit shall incorporate a solid-state compressor protector which provides anti-cycle reset capability at the space thermostat, should any of the following standard safety devices trip and shut off compressor.
      - 1) Compressor overtemperature, overcurrent.
      - 2) Loss-of-charge/low-pressure switch.
      - 3) Freeze-protection thermostat, evaporator coil.
      - 4) High-pressure switch.The lockout protection shall be easily disconnected at the control board, if necessary.
    - b. Heating section shall be provided with the following minimum protections:
      - 1) High-temperature limit switches.
      - 2) Induced draft motor speed sensor.
      - 3) Flame rollout switch.
      - 4) Flame proving controls.
- J. Operating Characteristics:
1. Unit shall be capable of starting and running at 125 F ambient outdoor temperature, meeting maximum load criteria of ARI Standard 210/240 or 360 at  $\pm$  10% voltage.
  2. Compressor with standard controls shall be capable of operation down to 25 F ambient outdoor temperature.
- K. Electrical Requirements:
1. All unit power wiring shall enter unit cabinet at a single factory-predrilled location.
- L. Motors:
1. Compressor motors shall be cooled by refrigerant passing through motor windings and shall have line break thermal and current overload protection.
  2. Indoor blower (evaporator-fan) motor shall have permanently lubricated bearings and inherent automatic-reset thermal overload protection.
  3. Totally enclosed condenser-fan motor shall have permanently lubricated bearings and inherent automatic-reset thermal overload protection.
  4. Induced draft motor shall have permanently lubricated, sealed bearings and inherent automatic reset thermal overload protection.
- M. Roof Curbs:
1. Formed galvanized steel with wood nailer strip and capable of supporting entire unit weight.
  2. Allows for installing and securing ductwork to curb prior to mounting unit on the curb.
- N. Integrated Economizers:
1. Integrated integral-modulating type capable of simultaneous economizer and compressor operation.
  2. Includes all hardware and controls to provide cooling with outdoor air.

3. Equipped with low-leakage dampers not to exceed 3% leakage, at 1 in. wg pressure differential.
  4. Capable of introducing up to 100% outdoor air in both minimum and fully open positions.
  5. Designed to close damper during loss-of-power situations with spring return built into motor (EconoMiser).
  6. The EconoMiser is a parallel blade design.
- O. High-Static Motor and Drive:
1. High-static motor and drive shall be factory-installed to provide additional performance range.
- P. Condenser Coil Guard Grille:
1. The grille protects the condenser coil from damage by large objects without increasing unit clearances.
- Q. Compressor Cycle Delay:
1. Unit shall be prevented from restarting for a minimum of 5 min. after shutdown.
- R. Unit-Mounted, Non-Fused Disconnect Switch:
1. Shall be factory-installed, internally-mounted, NEC and UL approved non-fused switch shall provide unit power shutoff. Shall be accessible from outside the unit and shall provide power off lockout capability.
- S. Convenience Outlet:
1. Shall be factory-installed and internally-mounted with easily accessible 115-v female receptacle. Shall include 15 amp GFI receptacle with independent fuse protection. Voltage required to operate convenience outlet shall be provided by a factory-installed step-down transformer. Shall be accessible from outside the unit.
- T. Hinged Panel Option:
1. Hinged panel option provide hinged access panels for the filter, compressor, evaporator fan, and control box areas. Filter hinged panels permit tool-less entry for changing filters. Each hinged panel is permanently attached to the rooftop unit.
- U. Flue Hood Protection Assembly:
1. Provides protection from the hot sides of the gas flue hood.
- V. Flue Discharge Deflector:
1. Package shall contain single-piece deflector and hardware to exhaust the flue discharge up and away from unit. The flue discharge deflector shall allow minimum flue side clearances to combustibles to be reduced to 18 inches.
- W. EconoMiser and Power Exhaust:
1. Package shall provide control of Internal building pressure. The system shall exhaust up to 100% of return air.
- X. Outdoor Air Enthalpy Sensor:
1. The outdoor air enthalpy sensor shall be used with the EconoMiser device to provide single enthalpy control. When used in conjunction with a return air enthalpy sensor, the EconoMiser device will provide different enthalpy control. The sensor allows the EconoMiser controller to determine if outside air is suitable for free cooling.
- Y. Return Air Enthalpy Sensor:

1. The return air enthalpy sensor shall be used with the EconoMiser device. When used in conjunction with an outdoor air enthalpy sensor, the EconoMiser device will provide differential enthalpy control.

## 2.2 APPROVED MANUFACTURERS

- A. Carrier
- B. Lennox
- C. York
- D. Trane

## PART 3 EXECUTION - Not Used

END OF SECTION

## SECTION 15801

### GENERAL DUCT REQUIREMENTS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. General procedures and requirements for ductwork.
  - 2. Repair leaks in ductwork, as identified by smoke test, at no additional cost to Owner.
  
- B. Related Sections
  - 1. Division 09 - Quality of acoustic sealant
  - 2. - Air test and balance and smoke testing of ductwork
  - 2. Section 15051 - General Mechanical Requirements

##### 1.2 SUBMITTALS

- A. [Samples](#) - Sealer and gauze proposed for sealing ductwork.
  
- B. [Quality Assurance / Control](#)
  - 1. Manufacturer's installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.
  - 2. Specification data on sealer and gauze proposed for sealing ductwork.

##### 1.3 QUALITY ASSURANCE

- A. Requirements - Construction details not specifically called out in this Section shall conform to applicable requirements of SMACNA HVAC Duct Construction Standards.
  
- B. [Pre-Installation Conference](#) - Schedule conference immediately before installation of ductwork.

#### PART 2 PRODUCTS

- A. Finishes, Where Applicable - Colors as selected by Architect.
  
- B. Duct Hangers
  - 1. One inch by 18 ga galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches apart. Do not use wire hangers.
  - 2. Attaching screws at trusses shall be 2 inch No. 10 round head wood screws. Nails not allowed.

#### PART 3 EXECUTION

##### 3.1 INSTALLATION

- A. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.

- B. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.
  
- C. Hangers And Supports
  - 1. Install pair of hangers close to each transverse joint and elsewhere as required by spacing indicated in table on Drawings.
  - 2. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
  - 3. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.

### 3.2 CLEANING

- A. Clean interior of duct systems before final completion.

END OF SECTION

SECTION 15812

LOW-PRESSURE STEEL DUCTS

PART 1 GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section
  - 1. Duct smoke detectors
- C. Related Sections
  - 1. - Smoke testing
  - 2. Section 15081 - Thermal Insulation for ducts, plenum chambers, and casings
  - 3. Section 15801 - General Duct Requirements
  - 4. Division 16 - Furnishing of duct smoke detectors

1.2 REFERENCES

- A. [American Society For Testing And Materials](#)
  - 1. ASTM A 653-00, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'

PART 2 PRODUCTS

2.1 COMPONENTS

- A. Sheet Metal - Fabricate ducts, plenum chambers and casings of zinc-coated, lock-forming quality steel sheets meeting requirements of ASTM A 653, with G 60 coating.
- B. Ducts
  - 1. Round Duct -
    - a. Spiral Seam - 28 ga minimum for ducts up to and including 14 inches in diameter.
    - b. Longitudinal Seam -
      - 1) 28 ga minimum for ducts up to and including 8 inches in diameter.
      - 2) 26 ga minimum for ducts over 8 inches and up to 14 inches in diameter.
- C. Duct Sealer For Interior Ducts
  - 1. [Approved Products](#) -
    - a. Duct Butter or Butter Tak by Cain Manufacturing Co Inc, Pelham, AL (800) 554-0342 or (205) 663-2200 [www.cainmfg.com](http://www.cainmfg.com)
    - b. DP 1010 by Design Polymerics, Fountain Valley, CA (800) 641-0808 or (714) 432-0600 [www.designpoly.com](http://www.designpoly.com)
    - c. S2 by Duro Dyne, Farmingdale, NY (800) 899-3876 or (516) 249-9000 [www.durodyne.com](http://www.durodyne.com)
    - d. Versa Grip 102 by Hardcast Inc, Wylie, TX (800) 527-7092 or (972) 442-6545 [www.hardcast.com](http://www.hardcast.com)
    - e. 15-325 by Kingco, King Adhesive Corp, St Louis, MO (800) 233-8171 or (314) 772-9953

- f. 44-41 by Mon-Eco Industries Inc, East Brunswick, NJ (800) 899-6326 or (908) 257-7942
- g. Airseal #11 by Polymer Adhesive Sealant Systems Inc, Irving, TX (888) 721-7325
- h. Multipurpose Duct Sealant by Trans-Continental Equipment Co,
- i. Water Base Duct Sealer by United McGill Corp, Columbus, OH (800) 624-5535 or (614) 836-9981 [www.unitedmcgillcorp.com](http://www.unitedmcgillcorp.com)

## 2.2 FABRICATION

- A. Ducts
  - 1. Straight and smooth on inside with joints neatly finished.
  - 2. Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
  - 3. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded. Crossbreak unlined ducts, duct panels larger than 48 inch vertical and horizontal sheet metal barriers, duct offsets, and elbows, or bead 12 inches on center.
    - a. Apply cross-breaking to sheet metal between standing seams or reinforcing angles.
    - b. Center of cross-break shall be of required height to assure surfaces being rigid.
  - 4. Duct drops to diffusers shall be round, square, or rectangular to accommodate diffuser neck. Drops shall be same gauge as branch duct.
    - a. Seal joints air tight.
    - b. Externally insulate round drops.
    - c. Internally line square and rectangular drops

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Interface With Other Work - Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures specified in Section 13352, at no additional cost to Owner.
- B. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer. Cover horizontal and longitudinal joints on exterior ducts with two layers of specified tape installed with specified adhesive.
- B. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- C. Ducts shall not bear on top of structural members.
- D. Paint ductwork visible through registers, grilles, and diffusers flat black.
- E. Properly flash where ducts protrude above roof.
- F. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.

END OF SECTION

## SECTION 15815

### NON-METAL DUCTS

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.
- B. Related Sections
  - 1. Section [15801](#) - General Duct Requirements

#### PART 2 PRODUCTS

##### 2.1 COMPONENTS

- A. Ducts
  - 1. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict air flow after bending.
  - 2. Insulation - Nominal 1-1/2 inches, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.
  - 3. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A-1989 and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.
  - 4. [Approved Products](#) -
    - a. ANCO-FLEX 4625 by Anco Products Inc, Elkhart, IN (800) 837-2626 or (574) 213-5574 [www.ancoproductsinc.com](http://www.ancoproductsinc.com)
    - b. PF/UPC #090 by Flex-Aire,
    - c. RJ-30 by Flexible Air Movers Inc,
    - d. G-KM by Thermaflex by Flexible Technologies, Abbeville, SC (864) 459-5441 [www.wereflexible.com](http://www.wereflexible.com)
    - e. Type 4m Insulated by Flexmaster USA Inc, Houston, TX (713) 462-7694 [www.flexmasterusa.com](http://www.flexmasterusa.com)
- B. Cinch Bands - Nylon, 3/8 inch removable and reusable type.

#### PART 3 EXECUTION

##### 3.1 INSTALLATION

- A. Install duct in fully extended condition free of sags and kinks, using 36 inch maximum lengths.
- B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with specified cinch bands.

END OF SECTION

## SECTION 15820

### DUCT ACCESSORIES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Sections
  - 1. Section 15801 - General Duct Requirements

##### 1.2 REFERENCES

- A. [American Society for Testing and Materials](#)
  - 1. ASTM A 653-00, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'
  - 2. ASTM C 665-98, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing'
  - 3. ASTM C 1071-00, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Acoustical Material)'

#### PART 2 PRODUCTS

##### 2.1 COMPONENTS

- A. Acoustical Duct Liner
  - 1. One inch thick, 1-1/2 lb density fiberglass conforming to requirements of ASTM C 1071. Liner will not support microbial growth when tested in accordance with ASTM C 665.
  - 2. [Approved Products](#) -
    - a. Ultralite or ToughGard by CertainTeed
    - b. Duct Liner E-M by Knauf Fiber Glass
    - c. Akousti-Liner by Manson Insulation
    - d. Aeroflex Plus by Owens Corning
    - e. Linacoustic by Johns-Manville
  - 3. Adhesive -
    - a. [Approved Water-Based Products](#) -
      - 1) Cain - Hydrotak
      - 2) Design Polymerics - DP2501 or DP2502 (CMCL-2501)
      - 3) Duro Dyne - WSA
      - 3) Hardcast - IA-901
      - 4) Kingco - 10-568
      - 5) Miracle - PF-101
      - 6) Mon-Eco - 22-67
      - 7) Polymer Adhesive - Glasstack #35
      - 8) Techno Adhesive - 133
      - 9) United McGill - Uni-tack
    - b. -
      - 1) Cain - Safetak
      - 2) Duro Dyne - FPG
      - 3) Hardcast - Glas-Grip 648-NFSE

- 4) Kingco - 15-137
  - 5) Miracle - PF-91
  - 6) Mon-Eco - 22-24
  - 7) Polymer Adhesive - Q-Tack
  - 8) Techno Adhesive - 'Non-Flam' 106
  - c. [Approved Solvent-Based \(flammable\) Products](#) -
    - 1) Cain - HV200
    - 2) Duro Dyne - MPG
    - 3) Hardcast - Glas-Grip 636-SE
    - 4) Kingco - 15-146
    - 5) Miracle - PF-96
    - 6) Mon-Eco - 22-22
    - 7) Polymer Adhesive - R-Tack
    - 8) Techno Adhesive - 'Flammable' 106
4. Fasteners -
- a. Adhesively secured fasteners not allowed.
  - b. [Approved Products](#) -
    - 1) AGM Industries Inc - 'DynaPoint' Series RP-9 pin
    - 2) Cain
    - 3) Duro Dyne
    - 4) Omark dished head 'Insul-Pins'
    - 5) Gripnails may be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.
- B. Flexible Equipment Connections
1. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
  2. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250 deg F.
  3. [Approved Products](#) -
    - a. Cain - N-100
    - b. Duro Dyne - MFN
    - c. Elgen - ZLN
    - d. Ventfabrics - Ventglas
    - e. Ductmate - ProFlex
- C. Duct Access Doors
1. Factory built insulated access door with hinges and sash locks. Construction shall be galvanized sheet metal, 24 ga minimum.
  2. Fire and smoke damper access doors shall have minimum clear opening of 12 inches square or larger as shown on Drawings.
  3. [Approved Products](#) -
    - a. AirBalance - Fire/Seal FSA 100
    - b. Air-Rite - Model HAD-2
    - c. Cesco - HDD
    - d. Flexmaster - Spin Door
    - e. Kees Inc - ADH-D
    - f. Nailor - 085H-01
    - g. Pottorff - 60-HAD
    - h. Ruskin - ADH-24
- D. Dampers And Damper Accessories
1. Locking Quadrant Damper Regulators -
    - a. [Approved Products](#) -
      - 1) Duro Dyne - KS-38
      - 2) Ventfabrics - Ventline 555
      - 3) Young - No. 1
  2. Concealed Ceiling Damper Regulators -

- a. **Approved Products** -
  - 1) Cain
  - 2) Duro Dyne
  - 3) Metco Inc
  - 4) Ventfabrics - 666 Ventlok
  - 5) Young - 301
- 3. Volume Dampers -
  - a. Factory-manufactured 16 ga galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch clearance all around.
    - 1) Damper shall operate within acoustical duct liner.
    - 2) Provide channel spacer equal to thickness of duct liner.
  - b. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
  - c. **Approved Products** -
    - 1) Air-Rite - Model CD-2
    - 2) American Warming - VC-2-AA
    - 3) Arrow - OBDAF-207
    - 4) C & S - AC40
    - 5) Cesco - AGO
    - 6) Daniel - CD-OB
- E. Air Turns
  - 1. Single thickness vanes. Double thickness vanes not acceptable.
  - 2. 4-1/2 inch wide vane rail. Junior vane rail not acceptable.
- F. Branch Tap for Runout Ductwork
  - 1. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 653, with G-90 coating.
  - 2. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
  - 3. Manual Volume Damper -
    - a. Single blade, 22 ga minimum
    - b. 3/8 inch minimum square rod with brass damper bearings at each end.
    - c. Heavy duty locking quadrant on 1-1/2 inch high stand-off mounting bracket attached to side of round duct.
  - 4. **Approved Products** -
    - a. HET by Air-Rite
    - b. HETD-L by Daniel
    - c. STO by Flexmaster
    - d. HET by Sheet Metal Connectors
    - e. Team Mechanical

## 2.2 FABRICATION

- A. Duct Liner
  - 1. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with 3/4 inch long mechanical fasteners 12 inches on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
  - 2. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
  - 3. Coat longitudinal and transverse edges of liner with adhesive.
- B. Air Turns

1. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
2. Quiet and free from vibration when system is in operation.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Duct Liner
  1. Furnish and install acoustic lining in following types of ducts -
    - a. Supply air
    - b. Return air
    - c. Mixed air
    - d. Transfer air
    - e. Relief air
    - f. Exhaust air
    - g. Elbows, fittings, and diffuser drops greater than 12 inches in length.
- B. Flexible Connections - Install flexible inlet and outlet duct connections to each furnace.
- C. Access Doors In Ducts
  1. Install at each manual outside air damper and at each motorized damper. Locate doors within 6 inches of installed dampers.
  2. Install within 6 inches of fire dampers and in Mechanical Room if possible. Install on side of duct that allows easiest access to damper.
- D. Dampers And Damper Accessories
  1. Install concealed ceiling damper regulators.
    - a. Paint cover plates to match ceiling tile.
    - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
  2. Provide each take-off with an adjustable volume damper to balance that branch.
    - a. Anchor dampers securely to duct.
    - b. Install dampers in main ducts within insulation.
    - c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
    - d. Where concealed ceiling damper regulators are installed, provide cover plate.
  3. Install motorized dampers.

END OF SECTION

## SECTION 15851

### DIFFUSERS, REGISTERS, AND GRILLES

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To
  - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents
- B. Related Sections
  - 1. Section [15801](#) - General Duct Requirements

##### 1.2 MAINTENANCE

- A. Extra Materials - Leave tool for removing core of each different type of grille for building custodian.

#### PART 2 PRODUCTS

##### 2.1 MANUFACTURED UNITS

- A. Ceiling Return And Transfer Grilles
  - 1. Finish - Off-white baked enamel
  - 2. 1/2 inch spacing.
  - 3. [Approved Products](#) -
    - a. Carnes - RSLA
    - b. J & J - S90H
    - c. Krueger - S85H
    - d. Metal\*Aire - SRH
    - e. Nailor - 6155H
    - f. Price - 535
    - g. Titus - 355RL or 355 SL
    - h. Tuttle & Bailey - T70D
- B. Ceiling Diffusers
  - 1. Finish - Off-white baked enamel
  - 2. [Approved Products](#) -
    - a. Carnes - SKSA
    - b. J & J - R-1400
    - c. Krueger - SH
    - d. Metal\*Aire - 5500S
    - e. Nailor - 65OOB
    - f. Price - SMD
    - g. Titus - TDC
    - h. Tuttle & Bailey - MS

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side.

END OF SECTION

## SECTION 15915

### ELECTRIC AND ELECTRONIC CONTROL

#### PART 1 GENERAL

##### 1.1 SUMMARY

- A. The systems shall consist of a multiple zone capacity programmable, communicating logic control panel, multiple zone thermostats, zone dampers, and bypass damper and controllers. The system control devices shall be capable of stand-alone application or as a multiple system networked in a communication bus.
- B. This contractor shall provide all components of control system including, but not limited to, control panels, thermostats, conduits, junction boxes, transformers, dampers, damper actuators and wiring for control system. Division 16 will provide 120 volt in a J-box at each zone damper location.

##### 1.2 QUALITY ASSURANCE

- A. The control system shall be designed to conform to UL and CSA standards.

##### 1.3 DELIVERY, STORAGE AND HANDLING

- A. The system control products shall be stored and handled per manufacturer's recommendations.

#### PART 2 PRODUCTS

##### 2.1 EQUIPMENT

- A. Logic Control Panel (Robershaw Slim Zone Premier SZP) -
  - 1. Ultra slim styled cabinet.
  - 2. 2 modes of operation: Timesharing or Differential Control.
  - 3. 4 lines by 20 character backlit LCD display.
  - 4. Friendly user interface which allows access to features such as:
    - a. Panel setup.
    - b. System programming (temperatures, schedules, 2 or 4 events per day).
    - c. 24 hour clock.
    - d. Temperature display in Fahrenheit or Celsius.
    - e. Equipment test.
  - 5. LED status indicators for all system functions.
  - 6. Solid state control module with current limited relay outputs.
  - 7. System shall be capable of 4 zones and bypass damper control. Provide expander modules (SZEX) to main control panel as required.
  - 8. 2-speed fan output.

9. 45 second fan purge into last zone(s) calling.
  10. Constant or automatic fan during occupied schedule.
  11. 3 wire damper capability such that dampers power open and power close.
  12. High/low limit down staging.
  13. High/low balance control.
  14. Minimum heating and cooling ON/OFF times (selectable).
  15. Short cycle protection.
  16. Occupied/unoccupied cycle capability.
  17. Manual or automatic changeover.
  18. Smoke detector input.
  19. Dry contact to control external exhaust fan (RTU-3 only).
- B. Zone Thermostat (Robershaw DSL-520P)
1. DSL-520P solid state microprocessor temperature control device to exchange data with the control panel to optimize the zone environment.
  2. Provide with:
    - a. Heat, cool, auto and off mode buttons.
    - b. Auto and on fan button.
    - c. Keypad lockout features to -
      - 1) Prevent setup changes.
      - 2) Limit setpoint adjustment to +/-3°F.
    - d. Temperature display
    - e. Event symbols.
- C. Variable Volume Control Dampers and Bypass Damper -
1. Rectangular opposed blade rectangular zone damper, constructed of heavy gauge extruded aluminum blades attached to extruded aluminum octagonal shafts supported by nylon bushings for smooth operation and eliminated blade slippage.
  2. Round dampers, constructed of rolled galvanized steel with stiffening ribs to maintain rigidity. A single steal offset blade is attached to a 1-piece steal shaft connected with nylon bearings for smooth operations.
  3. Dampers shall be powered by a 3-wire power open-power close actuator. Damper shall have a minimum setpoint for ventilation.
- D. Bypass System
1. Bypass activities shall be fully controlled by the SZEM module which monitors the system static pressure and modulates a motorized bypass damper accordingly. The static pressure value shall be communicated to the SZP control module.

- E. High and Low Temperature Limits
  - 1. When bypassing conditioned air it is important to consider high and low limit control to prevent coil freeze up or overheating. The SZEM module monitors the supply air temperature and signals the SZP control module when the high and low limits are exceeded. System air temperature value is communicated to the SZP control module.
- F. Outdoor Temperature Measurements
  - 1. Outdoor air temperature is communicated to the SZP control module. Outdoor temperature value may be displayed at both the SZP control module and zone thermostats. Refer to the information provided with the SZEM module for detailed installation instructions.

### 2.3 SERVICE AND WARRANTY

- A. After installation, system start-up shall be completed. All thermostats and related components will be adjusted. The equipment being controlled by the specified control system shall be in operation and fully checked. The entire system must be in operation for 24 hours prior to seeking acceptance from the owner/engineer.
- B. The control system herein specified shall be free from defects in workmanship and material under normal use and service. If, within 12 months from date of acceptance by owner/engineer, any of the equipment herein described is proved to be defective in workmanship or material, it will be repaired, adjusted, or replaced free of charge by the installing contractor.

## PART 3 INSTALLATION

### 3.1 MANUFACTURERS

- A. System is based on Robershaw Slimzone Premier Zone Control. Other manufacturers include:
  - 1. Carrier
  - 2. Alerton

END OF SECTION

**SECTION 15940**

**SEQUENCE OF OPERATION**

**PART 1 GENERAL**

- A. Timeshare -
1. The timeshare control algorithm is recommended for zoning applications with less than six zones. Through the programming process, the contractor selects the minimum number of zones required to energize a given number of stages for both heating and cooling. Once a heating or cooling call from a zone or zones matches the programmed minimum number, the control panel will first open the associated zone damper(s) to allow conditioned air to be discharged into the calling zone(s). The panel will close any zone damper(s) not matching the established mode of operation. The mode of operation is established on a First Call Priority basis. The panel will energize the minimum number of zones required to energize the equipment are satisfied. However, if during the first call other zones call in the opposite mode equal to the established programmed minimums the control panel will energize the equipment in the opposite mode of operation if all "first call" zones have not been satisfied within a fixed 20 minute time frame.
  2. The temperature controls shall be initially programmed in the timeshare mode.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Electrical equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Grout.
  - 5. Common electrical installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
  - 1. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 3. Pressure Plates: Plastic Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.

- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

### 3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.
- G. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

### 3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 16051

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Electronic safety and security equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Grout.
  - 5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Sleeves for Rectangular Openings: Galvanized sheet steel.
  - 1. Minimum Metal Thickness:
    - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 3. Pressure Plates: Plastic Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

### 3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

- A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.
- G. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 16053

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment[.][, plus the following special applications:]
  - 1. Overhead-lines grounding.
  - 2. Underground distribution grounding.
  - 3. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
  - 1. Test wells.
  - 2. Ground rods.
  - 3. Ground rings.
  - 4. Grounding arrangements and connections for separately derived systems.
  - 5. Grounding for sensitive electronic equipment.

- C. Field quality-control test reports.

- D. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm) in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad 3/4 inch by 10 feet (19 mm by 3 m)

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
  - 1. Bury at least 24 inches (600 mm) below grade.

2. Duct-Bank Grounding Conductor: Bury **12 inches (300 mm)** above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
  1. Install bus on insulated spacers **1 inch (25 mm)**, minimum, from wall **6 inches (150 mm)** above finished floor, unless otherwise indicated.
  2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- E. Install insulated equipment grounding conductors with all feeders and branch circuits.
- F. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  1. Feeders and branch circuits.
  2. Lighting circuits.
  3. Receptacle circuits.
  4. Single-phase motor and appliance branch circuits.
  5. Three-phase motor and appliance branch circuits.
  6. Flexible raceway runs.
  7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
  8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
  9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- G. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- H. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- I. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- J. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

- K. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

### 3.2 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are **2 inches (50 mm)** below finished floor or final grade, unless otherwise indicated.
  - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
  - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 2 Section "Underground Ducts and Utility Structures," and shall be at least **12 inches (300 mm)** deep, with cover.
  - 1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
  - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
  - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
  - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
  - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
  - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than **60 feet (18 m)** apart.
- I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column extending around the perimeter of building
  - 1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
  - 2. Bury ground ring not less than **24 inches (600 mm)** from building foundation.
- J. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of **20 feet (6 m)** of bare copper conductor not smaller than No. 4 AWG.
  - 1. If concrete foundation is less than **20 feet (6 m)** long, coil excess conductor within base of foundation.
  - 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

### 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
  - 5. Substations and Pad-Mounted Equipment: 5 ohms..
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

- B. Related Sections include the following:

1. Division 16 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

- A. The IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: Refer to structural specification
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: III

1.5 SUBMITTALS

- A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

- a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an evaluation service member of ICC-ES
      - b. Annotate to indicate application of each product submitted and compliance with requirements.
    3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.
  - B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
    1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
      - a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 16 Sections for equipment mounted outdoors.
    2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
    3. Field-fabricated supports.
    4. Seismic-Restraint Details:
      - a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
      - b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
  - C. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
  - D. Welding certificates.
  - E. Field quality-control test reports.
- 1.6 QUALITY ASSURANCE
- A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
  - B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

- D. Comply with NFPA 70.

**PART 2 - PRODUCTS**

**2.1 VIBRATION ISOLATORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

**2.2 SEISMIC-RESTRAINT DEVICES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

- B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an evaluation service member of ICC-ES

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

- C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

- D. Restraint Cables: ASTM A 603 galvanized steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod. Do not weld stiffeners to rods.

- F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

- G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
- H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
- I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
- J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

## 2.3 FACTORY FINISHES

- A. Finish: Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
  - 1. Powder coating on springs and housings.
  - 2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
  - 3. Baked enamel or powder coat for metal components on isolators for interior use.
  - 4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 APPLICATIONS

- A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an evaluation service member of ICC-ES
- B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled where required to prevent buckling of hanger rods due to seismic forces.

- C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

### 3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

- A. Equipment and Hanger Restraints:
  - 1. Install restrained isolators on electrical equipment.
  - 2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds **0.125 inch (3.2 mm)**.
  - 3. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES providing required submittals for component.
- B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- D. Drilled-in Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
  - 4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
  - 5. Set anchors to manufacturer's recommended torque, using a torque wrench.
  - 6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

### 3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections.
- C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

### 3.6 ADJUSTING

- A. Adjust isolators after isolated equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Adjust active height of spring isolators.
- D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 16074

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Identification for raceway and metal-clad cable.
  - 2. Identification for conductors and communication and control cable.
  - 3. Underground-line warning tape.
  - 4. Warning labels and signs.
  - 5. Instruction signs.
  - 6. Equipment identification labels.
  - 7. Miscellaneous identification products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.145.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Color for Printed Legend:
  - 1. Power Circuits: Black letters on an orange field.
  - 2. Legend: Indicate system or service and voltage, if applicable.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, **2 inches (50 mm)** long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; **2 inches (50 mm)** wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than **3 mils (0.08 mm)** thick by **1 to 2 inches (25 to 50 mm)** wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- C. Aluminum Wraparound Marker Labels: Cut from **0.014-inch- (0.35-mm-)** thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.
- D. Metal Tags: Brass or aluminum, **2 by 2 by 0.05 inch (50 by 50 by 1.3 mm)**, with stamped legend, punched for use with self-locking nylon tie fastener.
- E. Write-On Tags: Polyester tag, **0.010 inch (0.25 mm)** thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.
  - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
  - 1. Not less than **6 inches (150 mm)** wide by **4 mils (0.102 mm)** thick.
  - 2. Compounded for permanent direct-burial service.

3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

## 2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. **1/4-inch (6.4-mm)** grommets in corners for mounting. Nominal size, **7 by 10 inches (180 by 250 mm)**.
- D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with **0.0396-inch (1-mm)** galvanized-steel backing; and with colors, legend, and size required for application. **1/4-inch (6.4-mm)** grommets in corners for mounting. Nominal size, **10 by 14 inches (250 by 360 mm)**.
- E. Warning label and sign shall include, but are not limited to, the following legends:
  1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
  2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR **36 INCHES (915 MM)**."

## 2.5 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum **1/16 inch (1.6 mm)** thick for signs up to **20 sq. in. (129 sq. cm)** and **1/8 inch (3.2 mm)** thick for larger sizes.
  1. Engraved legend with black letters on white face
  2. Punched or drilled for mechanical fasteners.
  3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.6 EQUIPMENT IDENTIFICATION LABELS

- A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/8 inch (10 mm)**.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/8 inch (10 mm)**. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.
- C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be **3/8 inch (10 mm)**.
- D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be **3/8 inch (10 mm)**.
- E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be **1 inch (25 mm)**

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
1. Minimum Width: **3/16 inch (5 mm)**.
  2. Tensile Strength: **50 lb (22.6 kg)**, minimum.
  3. Temperature Range: **Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C)**.
  4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 9 painting Sections.
1. Exterior Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):
    - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Exterior concrete and masonry primer.
      - 2) Finish Coats: Exterior semigloss acrylic enamel.
  2. Exterior Concrete Unit Masonry:
    - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.
      - 1) Block Filler: Concrete unit masonry block filler.
      - 2) Finish Coats: Exterior semigloss acrylic enamel.
  3. Exterior Ferrous Metal:
    - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Exterior ferrous-metal primer.
      - 2) Finish Coats: Exterior semigloss alkyd enamel.
  4. Exterior Zinc-Coated Metal (except Raceways):
    - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Exterior zinc-coated metal primer.
      - 2) Finish Coats: Exterior semigloss alkyd enamel.
  5. Interior Concrete and Masonry (Other Than Concrete Unit Masonry):
    - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
      - 1) Primer: Interior concrete and masonry primer.
      - 2) Finish Coats: Interior semigloss alkyd enamel.
  6. Interior Concrete Unit Masonry:
    - a. Semigloss Acrylic-Enamel Finish: Two > finish coat(s) over a block filler.
      - 1) Block Filler: Concrete unit masonry block filler.
      - 2) Finish Coats: Interior semigloss acrylic enamel.
  7. Interior Gypsum Board:

- a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
  - 1) Primer: Interior gypsum board primer.
  - 2) Finish Coats: Interior semigloss acrylic enamel.
- 8. Interior Ferrous Metal:
  - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior ferrous-metal primer.
    - 2) Finish Coats: Interior semigloss acrylic enamel.
- 9. Interior Zinc-Coated Metal (except Raceways):
  - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
    - 1) Primer: Interior zinc-coated metal primer.
    - 2) Finish Coats: Interior semigloss acrylic enamel.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A Identify with orange self-adhesive vinyl labe
- B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, self-adhesive vinyl tape applied in bands
  - 1. Fire Alarm System: Red.
  - 2. Fire-Suppression Supervisory and Control System: Red and yellow.
  - 3. Combined Fire Alarm and Security System: Red and blue.
  - 4. Security System: Blue and yellow.
  - 5. Mechanical and Electrical Supervisory System: Green and blue.
  - 6. Telecommunication System: Green and yellow.
  - 7. Control Wiring: Green and red.
- C. Power-Circuit Conductor Identification: For primary and secondary conductors No. 1/0AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.
- D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
  2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
  3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.
- F. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
    - a. Power transfer switches.
    - b. Controls with external control power connections.
  2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.
- H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
    - a. Indoor Equipment: Adhesive film label Unless otherwise indicated, provide a single line of text with **1/2-inch- (13-mm-)** high letters on **1-1/2-inch- (38-mm-)** high label; where 2 lines of text are required, use labels **2 inches (50 mm)** high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
  2. Equipment to Be Labeled:
    - a. Panelboards, electrical cabinets, and enclosures.
    - b. Access doors and panels for concealed electrical items.
    - c. Electrical switchgear and switchboards.
    - d. Transformers.
    - e. Electrical substations.
    - f. Emergency system boxes and enclosures.
    - g. Motor-control centers.
    - h. Disconnect switches.
    - i. Enclosed circuit breakers.
    - j. Motor starters.
    - k. Push-button stations.
    - l. Power transfer equipment.
    - m. Contactors.
    - n. Remote-controlled switches, dimmer modules, and control devices.

- o. Battery inverter units.
- p. Battery racks.
- q. Power-generating units.
- r. Voice and data cable terminal equipment.
- s. Master clock and program equipment.
- t. Intercommunication and call system master and staff stations.
- u. Television/audio components, racks, and controls.
- v. Fire-alarm control panel and annunciators.
- w. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.
- x. Monitoring and control equipment.
- y. Uninterruptible power supply equipment.
- z. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

### 3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at **50-foot (15-m)** maximum intervals in straight runs, and at **25-foot (7.6-m)** maximum intervals in congested areas.
- G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
  - 1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.
    - c. Phase C: Blue.
  - 3. Colors for 480/277-V Circuits:
    - a. Phase A: Brown.
    - b. Phase B: Orange.
    - c. Phase C: Yellow.
  - 4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of **6 inches (150 mm)** from terminal points and in boxes where splices or taps are made. Apply

last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

- H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at **6 to 8 inches (150 to 200 mm)** below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds **16 inches (400 mm)** overall.
- J. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION 16075

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. Building wires and cables rated 600 V and less.
- 2. Connectors, splices, and terminations rated 600 V and less.
- 3. Sleeves and sleeve seals for cables.

- B. Related Sections include the following:

- 1. Division 16 Section "Voice and Data Communication Cabling" for cabling used for voice and data circuits.
- 2. Division 16 Section "Undercarpet Cables" for flat cables for undercarpet installations.
- 3. Division 16 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Alcan Products Corporation; Alcan Cable Division.
  - 2. American Insulated Wire Corp.; a Leviton Company.
  - 3. General Cable Corporation.
  - 4. Senator Wire & Cable Company.
  - 5. Southwire Company.
  - 6.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Hubbell Power Systems, Inc.
  - 3. O-Z/Gedney; EGS Electrical Group LLC.
  - 4. 3M; Electrical Products Division.
  - 5. Tyco Electronics Corp.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.4 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Advance Products & Systems, Inc.
  2. Calpico, Inc.
  3. Metraflex Co.
  4. Pipeline Seal and Insulator, Inc.
  5. <Insert manufacturer's name.>

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for panel feeders No. 4 AWG and larger]. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway
- E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway
- F. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway
- G. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or Metal-clad cable- Type MC as indicated on the drawings
- H. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway
- I. Branch Circuits Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway
- J. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- K. Class 1 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Electrical Supports and Seismic Restraints."
- F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least [6 inches (150 mm)] [12 inches (300 mm)] of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  - 1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
  - 2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both wall surfaces.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

- H. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and cable unless sleeve seal is to be installed
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."
- L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between cable and sleeve for installing mechanical sleeve seals.

### 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

### 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections and prepare test reports.
- C. Tests and Inspections:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- D. Test Reports: Prepare a written report to record the following:
1. Test procedures used.
  2. Test results that comply with requirements.
  3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 16120

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
  - 1. Division 2 Section "Underground Ducts and Utility Structures" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Custom enclosures and cabinets.
  - 2. For handholes and boxes for underground wiring, including the following:
    - a. Duct entry provisions, including locations and duct sizes.
    - b. Frame and cover design.

- c. Grounding details.
  - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
  - e. Joint details.
- C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Structural members in the paths of conduit groups with common supports.
  - 2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.
- D. Manufacturer Seismic Qualification Certification: Submit certification that enclosures and cabinets and their mounting provisions, including those for internal components, will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a. The term "withstand" means "the cabinet or enclosure will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will retain its enclosure characteristics, including its interior accessibility, after the seismic event
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Qualification Data: For professional engineer and testing agency.
- F. Source quality-control test reports.

## 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AFC Cable Systems, Inc.
  - 2. Alflec Inc.
  - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
  - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 5. Electri-Flex Co.
  - 6. Manhattan/CDT/Cole-Flex.

7. Maverick Tube Corporation.
  8. O-Z Gedney; a unit of General Signal.
  9. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. PVC-Coated Steel Conduit: PVC-coated
1. Comply with NEMA RN 1.
  2. Coating Thickness: 0.040 inch (1 mm), minimum.
- F. EMT: ANSI C80.3.
- G. FMC:
- H. LFMC: Flexible steel conduit with PVC jacket.
- I. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  2. Fittings for EMT: set-screw type.
  3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.
- J. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

## 2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
  2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  3. Arnco Corporation.
  4. CANTEX Inc.
  5. CertainTeed Corp.; Pipe & Plastics Group.
  6. Condux International, Inc.
  7. ElecSYS, Inc.
  8. Electri-Flex Co.
  9. Lamson & Sessions; Carlon Electrical Products.
  10. Manhattan/CDT/Cole-Flex.
  11. RACO; a Hubbell Company.
  12. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

- D. LFNC: UL 1660.
- E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.

### 2.3 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hoffman.
  - 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type [1] [12] [3R], unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type
- E. Finish: Manufacturer's standard enamel finish.

### 2.4 NONMETALLIC WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Hoffman.
  - 2. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

### 2.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Thomas & Betts Corporation.
    - b. Walker Systems, Inc.; Wiremold Company (The).
    - c. Wiremold Company (The); Electrical Sales Division.

- B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Butler Manufacturing Company; Walker Division.
    - b. Enduro Systems, Inc.; Composite Products Division.
    - c. Hubbell Incorporated; Wiring Device-Kellems Division.
    - d. Lamson & Sessions; Carlon Electrical Products.
    - e. Panduit Corp.
    - f. Walker Systems, Inc.; Wiremold Company (The).
    - g. Wiremold Company (The); Electrical Sales Division.

## 2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  - 2. EGS/Appleton Electric.
  - 3. Erickson Electrical Equipment Company.
  - 4. Hoffman.
  - 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
  - 6. O-Z/Gedney; a unit of General Signal.
  - 7. RACO; a Hubbell Company.
  - 8. Robroy Industries, Inc.; Enclosure Division.
  - 9. Scott Fetzer Co.; Adalet Division.
  - 10. Spring City Electrical Manufacturing Company.
  - 11. Thomas & Betts Corporation.
  - 12. Walker Systems, Inc.; Wiremold Company (The).
  - 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Metal Floor Boxes: semi-adjustable, rectangular.
- F. Nonmetallic Floor Boxes: Nonadjustable, round.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

## 2.7 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum **0.052- or 0.138-inch (1.3- or 3.5-mm)** thickness as indicated and of length to suit application.
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

## 2.8 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. Calpico, Inc.
  - 3. Metraflex Co.
  - 4. Pipeline Seal and Insulator, Inc.

## 2.9 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
  - 1. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
  - 1. Exposed Conduit: Rigid steel conduit.
  - 2. Concealed Conduit, Aboveground: Rigid steel conduit
  - 3. Underground Conduit: RNC, Type EPC-40PVC, direct buried.
  - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC
  - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R
  - 6. Application of Handholes and Boxes for Underground Wiring:
    - a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Fiberglass enclosures with polymer-concrete frame and cover, SCTE 77, Tier 15 structural load rating.
    - b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Heavy-duty fiberglass units with polymer-concrete frame and cover, SCTE 77, Tier 8 structural load rating.
    - c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with **3000-lbf (13 345-N)** vertical loading.
- B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT
  2. Exposed, Not Subject to Severe Physical Damage: EMT
  3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit Includes raceways in the following locations:
    - a. Loading dock.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
  4. Concealed in Ceilings and Interior Walls and Partitions: EMT
  5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
  6. Damp or Wet Locations: Rigid steel conduit
  7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: [1/2-inch (16-mm)] [3/4-inch (21-mm)] trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 16 Section "Electrical Supports and Seismic Restraints."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
  1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
  - J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
  - K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than **200-lb (90-kg)** tensile strength. Leave at least **12 inches (300 mm)** of slack at each end of pull wire.
  - L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
    - 1. **3/4-Inch (19-mm)** Trade Size and Smaller: Install raceways in maximum lengths of **50 feet (15 m)**.
    - 2. **1-Inch (25-mm)** Trade Size and Larger: Install raceways in maximum lengths of **75 feet (23 m)**.
    - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
  - M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
    - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    - 2. Where otherwise required by NFPA 70.
  - N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed **30 deg F (17 deg C)**, and that has straight-run length that exceeds **25 feet (7.6 m)**.
    - 1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
  - O. Flexible Conduit Connections: Use maximum of **72 inches (1830 mm)** of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
    - 1. Use LFMC in damp or wet locations subject to severe physical damage.
    - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
  - P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
  - Q. Set metal floor boxes level and flush with finished floor surface.
  - R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 2 Section "Earthwork" for pipe less than **6 inches (150 mm)** in nominal diameter.
2. Install backfill as specified in Division 2 Section "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within **12 inches (300 mm)** of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 2 Section "Earthwork."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with **3 inches (75 mm)** of concrete.
  - b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of **60 inches (1500 mm)** from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately **12 inches (300 mm)** above direct-buried conduits, placing them **24 inches (600 mm)** o.c. Align planks along the width and along the centerline of conduit.

#### 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from **1/2-inch (12.5-mm)** sieve to **No. 4 (4.75-mm)** sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures **1 inch (25 mm)** above finished grade.

#### 3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
  1. For sleeve cross-section rectangle perimeter less than **50 inches (1270 mm)** and no side greater than **16 inches (400 mm)**, thickness shall be **0.052 inch (1.3 mm)**.
  2. For sleeve cross-section rectangle perimeter equal to, or greater than, **50 inches (1270 mm)** and 1 or more sides equal to, or greater than, **16 inches (400 mm)**, thickness shall be **0.138 inch (3.5 mm)**.

- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.
- H. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and raceway unless sleeve seal is to be installed[ or unless seismic criteria require different clearance].
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 7 Section "Through-Penetration Firestop Systems."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between raceway and sleeve for installing mechanical sleeve seals.

### 3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

### 3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

### 3.8 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 16130

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
  - 2. Twist-locking receptacles.
  - 3. Wall-box motion sensors.
  - 4. Snap switches and wall-box dimmers.
  - 5. Communications outlets.
  - 6. Pendant cord-connector devices.
  - 7. Cord and plug sets.
  - 8. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.
- B. Related Sections include the following:
  - 1. Division 16 Section "Voice and Data Communication Cabling" for workstation outlets.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  - 3. Leviton Mfg. Company Inc. (Leviton).
  - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 5351 (single), 5352 (duplex).
    - b. Hubbell; HBL5351 (single), CR5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed through type. (maximum of two outlets, located in the same room, per GFCI outlet) Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; GF20.
- b. Pass & Seymour; 2084.

#### 2.4 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; L520R.
    - b. Hubbell; HBL2310.
    - c. Leviton; 2310.
    - d. Pass & Seymour; L520-R.

#### 2.5 PENDANT CORD-CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.
  - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
  - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

#### 2.6 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
  - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

#### 2.7 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
    - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
    - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
    - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
- C. Pilot Light Switches, 20 A:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221PL for 120 V and 277 V.

- b. Hubbell; HPL1221PL for 120 V and 277 V.
- c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
- d. Pass & Seymour; PS20AC1-PLR for 120 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

## 2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
  - 1. 600 W; dimmers shall require no derating when ganged with other devices.
  - 2. To be suitable for type of load

## 2.9 OCCUPANCY SENSORS

- A. Wall-Switch Sensors:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 6111 for 120 V, 6117 for 277 V.
    - b. Hubbell; WS1277.
    - c. Leviton; ODS 10-ID.
    - d. Pass & Seymour; WS3000.
    - e. Watt Stopper (The); WS-200.
  - 2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
- B. Wall-Switch Sensors:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Hubbell; AT120 for 120 V, AT277 for 277 V.
    - b. Leviton; ODS 15-ID.
  - 2. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
- C. Long-Range Wall-Switch Sensors:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Hubbell; ATP1600WRP.
    - b. Leviton; ODWWV-IRW.
    - c. Pass & Seymour; WA1001.
    - d. Watt Stopper (The); CX-100.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

D. Long-Range Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. Hubbell; ATD1600WRP.
  - b. Leviton; ODW12-MRW.
  - c. Watt Stopper (The); DT-200.
2. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft. (111 sq. m).

2.10 WALL PLATES

- A. Single and combination types; .1” thick Stainless Steel.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant.

2.11 FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: die-cast aluminum with satin finish.
- D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Blank cover with bushed cable opening

2.12 POKE-THROUGH ASSEMBLIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Hubbell Incorporated; Wiring Device-Kellems.
  2. Pass & Seymour/Legrand; Wiring Devices & Accessories.
  3. Square D/ Schneider Electric.
  4. Thomas & Betts Corporation.
  5. Wiremold Company (The).
- C. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

2.13 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
  2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  4. Existing Conductors:
    - a. Cut back and pigtail, or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pigtailling existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
  1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
  2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  4. Connect devices to branch circuits using pigtails that are not less than **6 inches (152 mm)** in length.
  5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
  6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
  7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  8. Tighten unused terminal screws on the device.
  9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right
  2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Dimmers:
1. Install dimmers within terms of their listing.
  2. Verify that dimmers used for fan speed control are listed for that application.
  3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.
- H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- 3.2 IDENTIFICATION
- A. Comply with Division 16 Section "Electrical Identification."
1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.
- 3.3 FIELD QUALITY CONTROL
- A. Perform tests and inspections and prepare test reports.
1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
  2. Test Instruments: Use instruments that comply with UL 1436.
  3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
  2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
  3. Ground Impedance: Values of up to 2 ohms are acceptable.
  4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  5. Using the test plug, verify that the device and its outlet box are securely mounted.
  6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Test straight blade convenience outlets in patient-care areas for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than **4 oz. (115 g)**.

**HFS Architects**  
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**HESA #0715.01**

**AASF AVIATION COMPLEX INTERIOR REMODEL**  
**Utah National Guard**

END OF SECTION 16140